

The American Statistician

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May 30, 1956

Letter to the Editor:

Inverse Binomial Sampling in a Finite Population

I recently found myself reading a finished thesis
whose acceptance or rejection could have been
substantially affected by whether or not the can-
didate had obtained as original work certain re-
sults which had in fact been published, but in such
location, and so vaguely indexed by subject in
Mathematical Reviews, that the student could not
be expected to know of the paper and only unlikely
coincidence would face him with an examiner who
did know it. One such result in the field of survey
sampling was derived by Glenn L. Burrows and
myself and was being processed for publication
when by mere chance we discovered the solution
concurrently published by Sandelius (1951) in
*Kungl. Lantbrukshogskolans Annaler (Ann. Roy.
Agric. Coll. of Sweden)* 18:123-7. Consequently
our paper was withdrawn, but I have since en-
countered two cases where the result was unknown
to workers who needed it. Doubtless it has been
and will be wanted by others unknown to us. The
problem pertains to inverse binomial sampling in
a finite population and the results obtained are
as follows:

Assume a population of N individuals of whom
 M have a named attribute. Individuals are drawn
one at a time until m having the attribute are ob-
served. Let the sample size when this occurs be n .
The unbiased estimator for $p = M/N$ is then

$$\hat{p} = \frac{m-1}{n-1}$$

and the unbiased estimator for its variance is

$$s^2(\hat{p}) = \frac{\hat{p}(1-\hat{p})}{n-2} \cdot \frac{N-n+1}{N}$$

The true (but unknown) variance is

$$\sigma^2(\hat{p}) = \frac{M(M-1)(N-M)}{N(N-1)(N-2)m} \left\{ 1 + \frac{2!(N-M-1)}{(m+1)(N-3)} \right. \\ \left. + \frac{3!(N-M-1)(N-M-2)}{(m+1)(m+2)(N-3)(N-4)} + \dots \right\} \\ - \frac{M(N-M)}{N^2(N-1)}$$

Sandelius stated the first two of these formulae
indicating briefly their derivation by extension of
an argument due to Finney (*Biometrika* 36:233-4,
1949). Each of us also stated formulae for "trun-
cated" sampling to keep n within a fixed bound.

In view of the difficulty of continually reviewing
publication media which are little known to most
U. S. statisticians, might it be helpful to record in
The American Statistician these findings which are
not otherwise easily encountered?

H. FAIRFIELD SMITH
North Carolina State College

Nominations of ASA Officers

The Committee on Elections, composed of William R. Leonard, Chairman, T. A. Bancroft and Howard Jones, has made the following nominations:

President-Elect

Walter E. Hoadley, Armstrong Cork Company

Vice-President (1957-59)

(one to be elected)

Churchill Eisenhart, National Bureau of Standards
Philip Hauser, University of Chicago

Directors (1957-59)

(two to be elected)

Albert H. Bowker, Stanford University
H. O. Hartley, Iowa State College
Geoffrey H. Moore, National Bureau of Economic Research
Ellis R. Ott, Rutgers University

Representative-at-Large (1957-58)

(one to be elected)

R. J. Eggert, Ford Motor Company
Donovan J. Thompson, University of Pittsburgh

In accordance with the Constitution, additional nominations may be made by petition signed by at least 25 members and submitted to the office of the Association in Washington, D.C. Ballots will be mailed on or before November 15th. These ballots will contain biographical material on each of the candidates.

Redistricting of ASA

The possibility of redistricting the American Statistical Association to insure better geographical representation on the Council and to make more effective the district organization has been under consideration for some time. The constitution provides: "The districts of the Association shall be determined by the Council on recommendation of the Board, based upon the distribution of the membership at the time of publication of each membership directory." At the October 26, 1955 Board and Council meeting, a committee was appointed to work out the issues. John Tukey was chairman and other members were Harry Alpert, Lucile Derrick, Frank Hanna and Donald C. Riley.

The recommendations of this committee were sent to Council members and to chapter presidents and secretaries with a request for an expression of views. It was the consensus that there was a need for redistricting, and that this should be undertaken on a geographic basis.

The matter was discussed further at the September

6 meeting of the Board and Council. The final decision will increase the size of the Council slightly and will result in several additional listings on the annual ballots to be distributed in November. All ASA members, in the U. S. and its territories and Canada, whether or not they belong to local chapters, will have an opportunity to vote for district representatives under the new system of districting.

The geographical areas of the new districts will be described when the ballots are sent out in November and will also be carried in a later issue of *The American Statistician*.

ASA Annual Meeting in Detroit

About 830 persons registered for the 116th Annual Meeting of the American Statistical Association. This includes a small number of persons who registered jointly for the ASA and the American Sociological Society meetings. The meeting was held at the Sheraton-Cadillac Hotel in Detroit from September 7-10. While the attendance was below that of the 1955 meeting, which was held in New York City in conjunction with meetings of the American Economic Association and several other allied associations, the Detroit meeting was a very successful one.

Several sessions were co-sponsored by the ASA and the American Sociological Society, while others were joint with the Institute of Mathematical Statistics, the Econometric Society and the Biometric Society (ENAR). One of the highlights of the meeting was the general session at which Gertrude M. Cox gave the presidential address. This was followed by a very enjoyable informal party. There were more exhibits than usual at the Detroit meeting, and considerable interest in them was displayed.

The list of newly-elected Fellows appears elsewhere in this issue.

New officers of the Association will be announced at the next meeting of the Board of Directors and Council in January. Gertrude M. Cox continues as President until that time, when she will be succeeded by President-Elect William R. Leonard, Director of the Statistical Office of the United Nations.

The next annual meeting will be held at the Hotel Ambassador in Atlantic City, September 10-13, 1957.

Samuel Weiss Memorial Fund—Progress Report

The Samuel Weiss Memorial Fund Committee, which was appointed to raise funds for a suitable memorial to Sam Weiss in recognition of his many contributions to the Association and to the development of statistics, will send out a letter shortly to

the ASA membership requesting contributions to the fund. It has been decided to establish a student assistance scholarship fund at the University of Pennsylvania, Sam's Alma Mater. Arrangements have been completed by which the University will administer the Fund in the form of a student-aid fellowship endowment, depending on the amount of money which is raised. Funds will be used either to make loans to graduate students in statistics or to make grants to such students.

Resolution of Thanks

The following resolution, which was read by Paul Meier, was adopted at the Presidential Address Session of the ASA Annual Meeting.

Be it resolved that the American Statistical Association at its 116th Annual Meeting in Detroit in September 1956, expresses its appreciation to:

The Program Committee, which under the Chairmanship of Conrad Taeuber planned a program that clearly reflects the vitality of the Statistical profession and gives a well-balanced expression to the wide variety of interests and activities of the membership of the Association; and to

The Local Arrangements Committee, which under the Chairmanship of James T. Oliver handled the numerous problems associated with providing the facilities and housing essential to the success of this Annual Meeting. The smooth functioning of the many sessions of this convention testifies to the thoroughness with which this task has been performed. This Committee has received able assistance from the Detroit Convention Bureau which took care of many of the details involved. Splendid cooperation has also been extended by the managements of the hotels, with particular credit going to the management of the Sheraton-Cadillac Hotel. Much of the success of these meetings has been due to the effective work of the Local Arrangements Committee and the host agencies of Detroit.

Research Fellowships in Psychometrics

The Educational Testing Service is offering for 1957-58 its tenth series of research fellowships in psychometrics leading to the Ph.D. degree at Princeton University. Open to men who are acceptable to the Graduate School of the University, the two fellowships each carry a stipend of \$2,500 a year and normally renewable. Fellows will be engaged in part-time research in the general area of psychological measurement at the offices of the Educational Testing Service and will, in addition, carry a normal program of studies in the Graduate School.

Suitable undergraduate preparation may consist either of a major in psychology with supporting work in mathematics, or a major in mathematics together with some work in psychology. However, in choosing fellows, primary emphasis is given to superior scholastic attainment and demonstrated re-

search ability rather than to specific course preparation.

The closing date for completing applications is January 4, 1957. Information and application blanks may be obtained from: Director of Psychometric Fellowship Program, Educational Testing Service, 20 Nassau Street, Princeton, New Jersey.

Social Science Research Council Fellowships, Grants and Summer Training Institutes

The Social Science Research Council will again offer in 1957 all types of fellowships and grants which were awarded in 1956, except undergraduate research stipends. The latter awards can no longer be offered because funds granted to the Council for that purpose have been exhausted.

Four new types of grants will be offered for the first time: Grants for research on American governmental processes, for field studies of political groups in foreign areas, and for research on national defense problems since 1939; also faculty research grants unrestricted as to subject matter or discipline within the field of social science.

Three summer institutes are now scheduled for 1957, and one or more others may be announced later. Two institutes on applications of mathematics in the social sciences will be held at Stanford University, one for social scientists and one for college teachers of mathematics, the latter being co-sponsored by the Mathematical Association of America. An institute on organization theory and research will be held at Carnegie Institute of Technology.

A booklet describing all of these offerings will be distributed about October first. Applications will be due not later than January 7, 1956 except for the grants for research on American Governmental processes, for which there are two competitions with closing dates of November 1 and March 1, and field studies of political groups and research on national defense problems for which applications should be submitted by November 15.

Job Openings for Statisticians

The Chemical Corps Engineering Command, Army Chemical Center, Maryland, has several openings for Analytical Statisticians (Engineering) at the Civil Service grades GS-9 and GS-11 with a starting salary of \$5440 to \$6390. The Engineering Command engages in design and analysis of a wide range of manufactured goods, chemicals, and apparatus. A central statistical engineering organization, which acts as a consultative and research unit, is maintained. Wide opportunities are offered for independent statistical research and professional advancement. Inquiries should be addressed to Mr. Louis E. Garono, Deputy for Engineering, Cml C Engineering Command, Army Chemical Center, Maryland.

The Office of Education needs senior statisticians

who have had experience with educational data. It also has openings for junior statisticians and statistical clerks. Applications should be sent to Joseph W. Kappel, Research and Statistical Services Branch, U. S. Office of Education, Washington 25, D. C.

A vacancy exists in the Food and Drug Administration, Department of Health, Education and Welfare, Washington, D. C. Starting salary ranges from \$3670 to \$6390, depending upon the qualifications of the applicant. Qualifications: Bachelor's degree with a major in mathematical statistics. Graduate study in statistics desirable and/or experience in the field of biostatistics, or sample surveys. Appointments will be made from eligibles who can qualify for the United States Civil Service register for the position. For further information, write to the Food and Drug Administration, Dept. of Health, Education and Welfare, Washington 25, D. C.

Opportunities in Federal Service

Economists and Statisticians, particularly those with little work experience, may be missing the best opportunity to enter the career service of the Federal Government. Those who have academic training and little or no experience in the fields of economics and statistics or combinations of them, may not be aware that the best Federal civil service examination for them to take is the Federal Service Entrance Examination. This includes those who are seniors in college, recent graduates and graduate students. Economists and Statisticians, as well as other specialists who take this general examination can be placed in fields of their specialization. Information about the Federal Service Entrance Examination can be secured from your nearest U.S. Civil Service Commission office. Other information which will be helpful is contained in two pamphlets which may be available from the Civil Service Commission or from college placement offices—"Futures in the Federal Government," Commission's pamphlet No. 30 and "Facts About the Federal Career Service," Commission's pamphlet No. 60.

Persons interested in entering professional work in these fields do not take specialized examinations. Persons with more work experience, eligible for higher levels in civil service, should take those specialized examinations.

Annual Statistics Show at CCNY

The Baruch School of Business of The City College in cooperation with the New York Metropolitan Chapter of the American Statistical Association and the American Society for Quality Control will hold its third annual Statistics Show at the City College (17 Lexington Avenue, New York City) on November 29, 1956 from 10 AM to 10 PM.

The show will feature exhibits by statistical and research agencies, governmental statistical organizations and professional societies in the field as well as manufacturers and distributors of statistical machines. The show will be open without charge to the general public as well as students and practitioners in the field.

Collected Papers on Improving the Quality of Statistical Surveys

"Improving the Quality of Statistical Surveys" is a collection of eight papers contributed as a memorial to Samuel Weiss, recent Executive Director of ASA, and first presented in a summary form at a meeting of the Washington Statistical Society held on April 26, 1956. Their publication is jointly sponsored by the Washington Statistical Society and the ASA. Each paper treats of some aspect of Federal statistics and the steps which are being undertaken to improve the quality of the results. Most of these undertakings have not been described elsewhere.

The range of statistics covered is great. Financial data, mortality and morbidity, agricultural production, business activity and employment are all represented. Some problems are those of large-scale collections of benchmark statistics, others are problems encountered in repetitive sample surveys, still others are primarily those of "spot" surveys in the field. The scope of the collection is indicated by the titles of the papers.

Foreword—William G. Cochran

Tax Returns as a Source of Benchmark Statistics
—Helen F. Demond

Use of a Sample Survey for Estimating an Aggregate Quarterly Financial Statement for a Population of Corporations—Dorothy M. Gilford and Charles L. Marks

Non-Sampling Errors in Agricultural Surveys—Walter A. Hendricks

New Measures of Economic Fluctuations, Preliminary Comments and Illustrations—Julius Shiskin

A Proposed Study for Extending the Scope and Improving the Quality of Mortality Data—W. Haenszel, I. M. Moriyama and M. G. Sirken

Controlling Quality in Railroad Traffic Statistics—R. Tynes Smith III

Some Problems in the Statistical Measurement of Chronic Disease—T. D. Woolsey and H. Nisselson

Some Notes on a Study of Response—Dudley E. Young

"Improving the Quality of Statistical Surveys" may be purchased at \$1.00 per copy from the American Statistical Association, 1757 K Street, N.W., Washington 6, D. C.

FEDERAL STATISTICAL ACTIVITIES

1957 Appropriations for Federal Economic Statistical Programs*

The 1957 Budget estimates as submitted to the Congress included about \$36.5 million for major current economic statistical programs, and about \$4 million in new appropriations for periodic census programs. Final action on 1957 appropriations allowed about \$35 million for the current programs—an increase of almost \$3 million over fiscal year 1956—and \$2.9 million for periodic census programs.

The increases granted—roughly two-thirds of those requested—are substantial, and will permit improvements needed in many of the Government's basic statistical and research programs. The increases are greatest in fields relating to improved data on agricultural production and marketing research and problems relating to low-income farm families. Funds are also provided to the Census Bureau for monthly estimates of retail inventories; and to the Bureau of Labor Statistics for extension of its program of labor turnover statistics, in cooperation with the States, and for improvements needed in the Consumer Price Index. Special interest also attaches to provision of funds to the Bureau of the Census for a national housing inventory and a Census of Governments.

Again this year the Congress disallowed increases sought to remedy basic inadequacies in our statistics on construction activity. Increases requested in the budget for the Office of Business Economics to improve key economic indicator series were also disallowed in toto. These proposals had been formulated in the light of recommendations made by the Joint Economic Committee after its careful review of needs for more adequate data for use in appraising current economic welfare.

Special Analysis J of the 1957 Budget Document summarized the budget requests for major statistical programs. Action on these requests is described below. The agencies whose programs are included in this summary, in whole or in part, are shown in Table 1, below.

Current Programs

The increases requested and allowed for major current statistical programs are shown by broad subject area in the following tabulation, and discussed in the following paragraphs.

Labor statistics.—Appropriations of 1957 for programs of the Departments of Labor, Commerce, and Agriculture in this area total over \$6.9 million—an increase of \$432,000 over fiscal year 1956. Of this increase, \$150,000 is for a nationwide study of wages in retail trade to be made by the Bureau of Labor Statistics. This project was not included in the Budget estimate for

*Increases Requested and Allowed, by Broad Subject Areas
(In thousands)*

Program	Increase requested for 1957 ¹	Increase allowed for 1957
Labor statistics	\$ 431	\$ 432 ²
Prices and price indexes	0	—52
Construction and housing	720	0
Production and distribution	1,688	1,525
Agricultural marketing research	1,222	950
Population and vital statistics	116	64
National income and business financial accounts	269	29
Total, Major current programs	4,446	2,948

¹ Includes \$1,363,000 in 1957 supplemental appropriation for the Department of Agriculture.

² Includes \$150,000 for retail wage survey by the Bureau of Labor Statistics, for which \$200,000 was requested in a supplemental appropriation for fiscal year 1956.

1957, but in a supplemental appropriation request for fiscal year 1956.

Of the increase included in the 1957 Budget estimate for BLS programs in this area, about \$150,000 was provided for extension of the cooperative Federal-State program of labor turnover statistics, initiated in fiscal year 1956, to additional States, with the program to be completed for about 40 States by the end of fiscal year 1957. Funds will also be available for technical improvements in existing national surveys of work injuries and extension to additional States of the coordinated Federal-State program of injury-rate data; and for printing a revised edition of the Occupational Outlook Handbook, for which research is already well advanced. No funds were allowed, however, for the proposed preparation of semimonthly estimates of employment trends in manufacturing, or for the study of labor conditions in Hawaii.

In the Agricultural Marketing Service, additional funds in 1957 provide for initiating work on the development of farm employment estimates by States. No increases in the area of labor statistics were included in the 1957 Budget estimate of the Bureau of the Census.

Prices and price indexes.—In the area of price statistics, proposed increases for 1957 for the Departments of Labor and Agriculture were entirely offset by a decrease in the Department of Agriculture budget, resulting from completion of the field work for the survey of farmers' expenditures.

In the Bureau of Labor Statistics, \$100,000 was allowed of the \$152,000 increase requested for improvements in the monthly Consumer Price Index. The additional funds will be used for development of better rental data in the index, more frequent pricing of certain commodities, and review of the outlet samples in perhaps as many as 20 cities.

A small increase in the Agricultural Marketing Service will be used for a pilot study of the interrelationship of

* Summary of final action on 1957 appropriations for agencies and programs included in the Special Analysis of Federal Economic Statistical Programs in the 1957 Budget Document, prepared by the Office of Statistical Standards, Bureau of the Budget, for the Subcommittee on Economic Statistics of the Joint Economic Committee.

agricultural and industrial income, to see how changes in prices and income in one sector affect the other.

Construction and housing.—Appropriations for 1957 of about \$0.5 million continue the programs in this area at the same level as in 1956. Major increases were requested to improve our present inadequate statistics on construction, particularly those relating to nonresidential construction. An increase of \$600,000 to the Business and Defense Services Administration for a three-part program to provide more complete and improved data on this segment was reduced to \$350,000 by the House, and eliminated entirely by the Senate and in the bill as finally passed. Likewise, smaller increases proposed for the Bureau of Labor Statistics for development of better estimates of labor requirements for construction and for the Census Bureau for a survey of advance public works planning were disallowed.

Production and distribution.—About \$12.3 million was appropriated for statistical programs in this broad area—an increase of about \$1.5 million over fiscal year 1956.

Nearly all of this increase is for programs in the Department of Agriculture. Increases of more than \$300,000 in the Agricultural Research Service provide for an expanded program of production economics research, in cooperation with State Agricultural Experiment Stations, including: (1) expansion of research to provide information needed to help low-income farm families increase their income-earning capacity (\$330,000); (2) research on farm costs and returns and on economics of water management (\$315,000); and (3) studies of the economic problems of farming in the Great Plains States (\$192,000). In the Agricultural Marketing Service, about \$500,000 additional funds were provided for expansion of work on developing new and modernized sampling techniques and improved crop and livestock estimating methods; and nearly \$100,000 for expansion of outlook work and related economic and statistical analysis.

Some of the increases requested in the Bureau of the Census were offset by decreases resulting from nonrecurring items. Funds available for 1957 provide for the development, through sampling methods, of monthly estimates of the movements in the dollar value of all retail store inventories. The foreign trade statistics program will be maintained at the level which existed before January 1956, when retrenchments were made necessary as a result of the greatly increased number of transactions to be tabulated. Work will also be started on preparation of "County Business Patterns" for the first quarter of 1956.

A small increase to the Bureau of Labor Statistics will provide for six case studies of the application and use of automated equipment at the plant level, but will be insufficient to allow for the proposed study of the potential impact of automation on an industry basis.

Agricultural marketing research.—Appropriations for 1957 of about \$6.7 million in this area include increases of almost \$1 million. Although the marketing research projects are not primarily statistical, they generally require the collection and analysis of statistical data. The additional funds in 1957 will be used for research directed toward development of expanded markets for agricultural

products, reduction of losses from waste and spoilage, and reduction of marketing costs. The 1957 appropriation also provided that not less than \$350,000 (as compared with \$250,000 in fiscal year 1956) be used for the "special study on the price spread between the farmer and the consumer".

Population and vital statistics.—Little change was proposed in this general area for fiscal year 1957. Additional funds were granted to the Agricultural Marketing Service for collection and analysis of basic data on low-income or underemployed segments of the rural population and ways of improving their occupational skills and utilization. These studies are in line with the recommendation of the Subcommittee on Low-Income Families of the Joint Economic Committee for "intensive studies to identify the population at substandard levels of living and the causes of their low economic status".

National income and business financial accounts.—The increases requested for 1957 in this area, although not large in amount, included some of the most important improvements needed in basic data from the standpoint of economic analysis. The \$240,000 increase proposed for the Office of Business Economics was directed toward meeting some of the recommendations made during the past year for strengthening statistical series used in appraising economic trends. These recommendations were made by the Joint Economic Committee and its subcommittees, and by the special task forces appointed by Federal Reserve, at the request of the Joint Economic Committee, to evaluate statistics in specified areas. The projects for which additional funds were requested were: (1) Improving estimates of consumer expenditures in the national accounts; (2) improving estimates of manufacturers' inventories; (3) correcting present inadequacies and providing greater detail in the quarterly estimates of expenditures for plant and equipment; and (4) resuming quarterly publication of estimates of business births and deaths. The House allowed \$40,000 of the \$240,000 increase requested; the Senate allowed no increase and reduced funds available by \$60,000; and the bill as finally enacted allowed the same amount as that appropriated for fiscal year 1956. None of the major changes planned is therefore possible during the fiscal year 1957.

For the financial reports program, conducted jointly by the Federal Trade Commission and the Securities and Exchange Commission, it will be possible to start work in fiscal 1957 on the development of a sample of mining and trade corporations to be included in the quarterly report. Installation of the new manufacturing sample for this program will be completed by FTC, and work on preparation and release of preliminary estimates will continue. The increase of about \$25,000 to SEC for 1957 will also make possible improvement of the estimates of plant and equipment expenditures for corporations, in the SEC portion of this program conducted jointly with the Office of Business Economics.

Periodic Census Programs

Census of Governments.—A three-year appropriation of \$2.1 million was requested for the 1957 Census of

Governments—the first to be taken since 1942. The final appropriation was \$1,750,000, but the conferees on the bill stated that the reduction in the amount “is not intended to reduce any of the functions proposed under this program”. Four major subjects will be covered in this census of 43 States and 103,000 local governments; tax valuations, governmental finances, public employment, and number and size of local governmental units.

National housing inventory.—The Budget estimate of the Bureau of the Census included \$1.3 million for an intercensal housing survey, designed to provide figures for the Nation and for 35 Standard Metropolitan Areas on changes in the housing inventory since the 1950 census and on the number and characteristics of dwelling units in existence. The final appropriation of \$1 million for this program will make it possible to provide this information for the National and for 9 Standard Metropolitan Areas: New York, Chicago, Philadelphia, Los Angeles, Detroit, Boston, Atlanta, Dallas, and Seattle.

Economic censuses.—Approval was given the Budget estimate of \$150,000 to enable the Census Bureau to begin planning and preparation for the 1958 Censuses of Business, Transportation, Manufactures, and Mineral Industries. A request for \$900,000 to be transferred from unused funds appropriated for the 1954 Census of Agriculture was also approved, to allow for completion of the 1954 Censuses of Business, Manufactures, and Mineral Industries.

TABLE 1

*Appropriations For Major Economic Statistical Programs,
By Agency
(In thousands)*

Agency	1956 Appropriation	1957 Budget estimate	1957 Appropriation
CURRENT PROGRAMS—			
Department of Agriculture			
Agricultural Marketing Service—			
Marketing research and agricultural estimates	\$11,653	\$13,565 ¹	\$13,200
Agricultural Research Service—			
Economics of production	1,689	2,561 ²	2,526
Department of Commerce			
Bureau of the Census	7,416 ³	7,620	7,475
Business and Defense Services Administration—Construction statistics	142	742	142
Office of Business Economics	960	1,200	960
Department of Health, Education, and Welfare			
Public Health Service—			
National Office of Vital Statistics	1,460	1,456	1,456
Department of Labor			
Bureau of Labor Statistics	6,407	7,000	6,887 ⁴
Department of the Treasury			
Internal Revenue Service—			
Statistical reporting	1,900	1,900	1,900
Federal Trade Commission			
Financial reports	235	235	235
Securities and Exchange Commission			
Financial Analysis Section	149	178	178
Total, Current programs	32,011	36,457	34,959

PERIODIC CENSUS PROGRAMS—

Department of Commerce			
Bureau of the Census			
Census of Agriculture, 1954	5,412	—	—
Censuses of Business, Manufactures, and Mineral Industries, 1954	4,304	5	5
Censuses of Business, Transportation, Manufactures and Mineral Industries, 1958	—	150	150
Census of Governments, 1957	—	2,100	1,750
National Housing Inventory	—	1,800	1,000
Total, Periodic census programs	9,716	4,050	2,900

¹ Includes increase of \$1,013,000 in 1957 supplemental appropriation request.

² Includes increase of \$350,000 in 1957 supplemental appropriation request.

³ Includes increase of \$87,500 for foreign trade statistics in supplemental appropriation for 1956.

⁴ Includes \$150,000 for retail wage survey, requested in supplemental appropriation for 1956, not in Budget estimates for 1957.

⁵ Transfer of \$900,000 from funds for 1954 Census of Agriculture.

Studies of Economic Effects of Minimum Wages

The Department of Labor has undertaken a broad program of studies designed to measure the economic effects of the new \$1.00 minimum hourly wage, established last year. The program is designed to help meet the Congressional directive in the 1955 amendments to the Fair Labor Standards Act that the report to Congress of the Wage and Hour Administrator “contain an evaluation and appraisal by the Secretary of the minimum wages established by this Act.”

Overall responsibility for the study is assigned to the Wage and Hour and Public Contracts Divisions, and most field work will be done by the Bureau of Labor Statistics. The separate studies comprised in the program are described in the following paragraphs. Findings will be made available as the studies are completed, and it is expected that a summary report will be issued in 1958.

Industry studies.—Data on wage distributions, earnings in selected plants, selected wage practices, and general wage changes will be collected by BLS field representatives from a sample of plants. Plans also include the collection of information on such plant practices as changes in hiring and employment practices and introduction of labor-saving equipment. Twelve low-wage industries have been selected for study. Survey coverage will be limited to the South for most of these industries, but national surveys are planned for two industries. The first phase of the study surveyed pay periods shortly before and after March 1, 1956, and the second phase will collect data for a year later.

Wage Distribution study—5 manufacturing groups.—This study will show the distribution of production workers by straight-time hourly earnings as of April 1956. Data will be collected by mail questionnaire, supplemented by visits of BLS field representatives. A comparison of the distributions in April 1956 with those shown in a previous study in April 1954 should indicate, in general terms, shifts in the wage structure.

Locality studies.—These studies will be made in 10 relatively small communities which have industries substantially affected by the \$1.00 minimum wage, and will show earnings distributions of employees by broad occupational groups and selected jobs. Three pay periods will be covered—February and May 1956 and May 1957. The surveys will aim to appraise both short- and long-run effects of the minimum wage on the community wage structure, and it is expected that data will be shown for the community as a whole and separately for covered and noncovered industries.

Study of economic indicators.—This study is designed to measure the overall effects on the economy of the \$1.00 minimum wage. Secondary data on trends in employment, wages, hours, prices, labor turnover and business turnover will be analyzed to determine whether the effect of the increase in the minimum wage was sufficiently marked to be reflected in the overall economic indicators.

Study of adjustments made by heavily affected plants.—Intensive studies will be made of about 300 plants to determine changes in productivity occasioned by the new minimum wage, and to obtain detailed information on methods used by heavily affected plants to adjust to the new minimum.

Follow-up of complaints of adverse effects.—Field visits are made to confirm the validity of reports coming to the attention of the Wage and Hour and Public Contracts Divisions in Washington. These follow-up studies are in the nature of case studies and are expected to provide descriptions of a variety of different situations in which the increase in the minimum wage was reported to have adverse effects.

—ROBERT B. STEFFES,
*Consultant for Departmental Standards,
Bureau of Labor Statistics,
Department of Labor*

"Monthly Report on Characteristics of the Insured Unemployed"

The Department of Labor initiated in May a series of monthly reports on the characteristics of the insured unemployed. The report is based upon a nationwide sample of about 1 percent of all claimants filing under State unemployment insurance laws, unemployment insurance for Federal workers, and unemployment compensation for veterans. The information is collected by all the 1,700 local offices of the State employment security agencies.

Insured unemployment programs cover over 40,000,000 workers—two-thirds of the Nation's employment. Most workers normally attached to manufacturing, mining, construction, utilities, trade, service, Federal Government, and finance, insurance and real estate are covered. Insured unemployment, however, differs in several respects from total unemployment as defined by the Bureau of the Census in its Monthly Report on the Labor force. Major differences are the exclusion from insured unemployment of new entrants to the labor force, persons

who have not worked or have had insufficient earnings in jobs covered by the insurance system, and persons who have exhausted their benefit rights.

Among the characteristics of the insured unemployed which the new series describes in considerable detail are industrial attachment, occupation, age, sex, and marital status. The series also shows the relationship between these factors and the length of insured unemployment, and for the first time presents current rates of insured unemployment by industry. With these new data it is possible to analyze insured unemployment against a background of the broader data on all unemployed provided by the Bureau of the Census.

A continuous history of the insured unemployment experience of sample claimants will be maintained, making it possible as time goes on to determine the extent to which such unemployment over the years is concentrated in certain population groups and to describe the characteristics of these groups. Moreover, the survey has been designed to provide a sample of persons for whom there will also be available a continuous employment history from the continuous work history sample of the Bureau of Old-Age and Survivors Insurance.

Copies of the "Monthly Report on Characteristics of the Insured Unemployed" are available on request from the Office of Information, Department of Labor, Washington 25, D. C.

—LOUIS LEVINE, *Bureau of Employment
Security, and*
SEYMOUR WOLFBEIN, *Bureau of Labor
Statistics, Department of Labor*

National Health Survey

A continuing national health survey and special studies of health in the United States were authorized by the 84th Congress in the National Health Survey Act, signed by the President on July 3. The new law authorizes the Public Health Service to conduct surveys and studies of the U. S. population, by sampling or other appropriate means, to determine the extent of illness and disability and such related information as the number of persons afflicted with chronic or other diseases, injuries, or handicapping conditions, including their age, sex, occupation, and ability to work; the type of disease, injury or handicap; the length of time that each person has been prevented from carrying on his occupation or other usual activities; and the economic and other impacts of such conditions. The law also authorizes the development and testing of new or improved methods for obtaining current data on illness and disability.

In enacting the bill, Congress declared that the latest information on the number and characteristics of persons suffering from heart disease, cancer and other diseases is now seriously out of date. Accordingly, it found that periodic inventories providing current information are urgently needed for an appraisal of the true state of health of the population, for adequate planning to improve health, for research in the field of chronic diseases, and for measurement of the numbers of persons in the

working ages so disabled as to be unable to perform gainful work.

The continuing survey will consist of household interviews in a representative sample of the population. In the special studies, to be conducted at intervals as needed, clinical methods will be brought to bear to measure morbidity in subsamples of the population interviewed in the household survey.

An appropriation of \$700,000 was made to the Public Health Service for this program in the fiscal year 1957. The Public Health Service will be responsible for the content, analysis and publication of statistical information from the surveys. The field work on the household survey will be performed under contract by the Bureau of the Census, which is to be responsible for sampling, hiring and training of interviewers, and the collection and processing of the data. A target date of March 1, 1957 has been set for beginning the field work on this phase of the program.

—GEORGE ST. J. PERROTT, *Chief,*
Division of Public Health Methods,
Public Health Service, Department
of Health, Education, and Welfare

Federal Reserve Study of Consumer Instalment Credit

The Board of Governors of the Federal Reserve System is conducting a special study of consumer instalment credit, designed as a searching and scientific examination of the role of consumer credit in a growing economy. The study is being made at the request of Arthur F. Burns, Chairman of the Council of Economic Advisers, on behalf of the President. Interest in the study has also been expressed by the Joint Economic Committee and by the Banking and Currency Committees of both the Senate and the House of Representatives.

Plans for the study include compilation of factual information not otherwise available in several areas. Various phases of the study will be conducted for the Board by qualified organizations or individuals. The five major parts of the Board's study will be:

(1) A national survey of a representative sample of new car buyers in 1954 and 1955. This survey is designed to provide a comprehensive picture of the part played by instalment credit in new car purchases. The survey is being conducted by National Analysts, Inc., of Philadelphia. It involves field interviews with a representative sample of individuals across the country in whose names new passenger cars were registered in 1954 and 1955, and also obtaining information from lenders' records on transactions financed by the use of credit. Questions are being asked of new car buyers regarding financing arrangements, occupation, family status, financial position, and related subjects.

(2) A national survey of new and used car dealers. This survey is being planned and carried out by Federal Reserve Bank personnel. Information is being collected by field interviews on dealers' problems and practices

in financing customers, in placing with lenders paper acquired in sales transactions, in obtaining financing terms appropriate to the demands of individual customers, and in financing inventories of new and used cars.

(3) Report on public policy aspects of instalment credit. The views of the consumer credit industry and others interested in consumer credit are being canvassed with respect to the question of desirability of instalment credit regulation. Mr. George D. Bailey, senior partner of the public accounting firm of Touche, Niven, Bailey & Smart, of Detroit, is a special consultant in charge of this part of the study for the Federal Reserve Board.

(4) Report on analyses by university specialists on data and knowledge needed. A conference of university specialists is being held in mid-October under the auspices of the National Bureau of Economic Research. Each participant is contributing an independent analysis of some aspect of instalment credit. The National Bureau is planning and organizing the conference and preparing a summary report to the Board.

(5) Comprehensive review and analysis of consumer instalment credit in the contemporary economic setting. This study is being prepared by the Federal Reserve staff. It will cover experience with regulative policies in this country and abroad, weigh alternative approaches, and list the arguments for and against a continuing governmental authority to regulate this credit area. It will also consider the unique characteristics of consumer instalment credit, its growth and cyclical pattern, its relation to other types of credit and to the credit market generally, and to overall economic stability.

The Broad program also includes two other parts: (1) an interim revision in the Board's regularly published series on consumer credit covering the period since 1947, with emphasis on changes since the last comprehensive revision, completed in early 1953. The revised series will embody results of a comprehensive survey of finance companies made by the Federal Reserve last year; new benchmarks from the periodic commercial bank call reports; and the credit findings from the Bureau of the Census 1955 retail trade survey; and (2) a survey by the Bureau of the Census of cash and credit buyers of new and used cars and new and used houses. A few questions were added to the Current Population Survey questionnaire for August, permitting the development of information on the income, age, labor force status, region, urban-rural residence, and other characteristics of those households using credit and those not using credit in connection with purchases of cars and houses over the past two and a half years.

It is anticipated that this comprehensive study of consumer instalment credit will be substantially completed by early 1957.

—KENNETH B. WILLIAMS, *Assistant Director,*
Division of Research and Statistics,
Board of Governors of the
Federal Reserve System

Recent Publications

A number of recent publications by Federal statistical agencies are described briefly below:

Occupational Characteristics (Series P-E, No. 1B), issued by the Bureau of the Census. Presents national data, based on a 3 1/3 percent sample in the 1950 Census of Population, on selected characteristics of the men and women workers in each of the 446 categories of the detailed classification system used in the 1950 Census. The characteristics shown include urban-rural residence, nativity and citizenship, race, age, marital status, residence in 1949 (population mobility), years of school completed, class of worker, hours worked during the census week, weeks worked in 1949, and income in 1949. Available from Superintendent of Documents, Government Printing Office, Washington 25, D.C., at \$1.50 a copy.

Population Mobility—States and State Economic Areas (Series P-E No. 4B), issued by the Bureau of the Census. Presents statistics on the extent to which the population 1 year old and over changed place of residence between 1949 and 1950, based largely on a 20-percent sample in the 1950 Census of Population. Mobility status is shown in cross-classifications with such characteristics as urban-rural residence, race, age, marital status, years of school completed, family income in 1949, employment status, and major occupation group. The information is presented for the United States, regions, geographic divisions, States, and State economic areas. Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C., at \$1.75 a copy.

Average Retail Prices, 1955: Selected Commodities and Services (Other Than Food and Housing) Included in the Consumer Price Index (Bulletin No. 1197), issued by the Bureau of Labor Statistics. Presents average retail prices for about 150 commodities and services priced for the Consumer Price Index, for monthly and quarterly dates from December 1954 to December 1955, in 20 large cities—Atlanta, Baltimore, Boston, Chicago, Cincinnati, Cleveland, Detroit, Houston, Kansas City (Mo.), Los Angeles, Minneapolis, New York, Philadelphia, Pittsburgh, Portland (Ore.), St. Louis, San Francisco, Scranton, Seattle, and Washington, D.C. The text discusses briefly some of the reasons for differences in retail prices among cities and methodological considerations necessary in making city comparisons. Available from Superintendent of Documents Government Printing Office, Washington 25, D. C., at 55 cents a copy.

Preliminary Reports, Statistics of Income for 1953, Parts 1 and 2, issued by the Internal Revenue Service. Part 1 (individual income tax returns) shows sources of income, deductions, and tax, by size of gross income, and a few key items by States. Part 2 (corporation income tax returns) shows current-year income and expenses and balance sheet data, classified by 24 types of manufacturing activities and 53 kinds of non-manufacturing businesses. Available from Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 20 cents for Part 1 and 25 cents for Part 2.

Federal Statistical Directory, 17th edition, issued by the Office of Statistical Standards, Bureau of the Budget. Lists the names, office room numbers and telephone numbers of the professional and technical personnel of Federal agencies engaged in statistical and research activities, by organizational unit within the agencies. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at 75 cents a copy.

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STUDIES IN THE HISTORY OF STATISTICAL METHOD

by

HELEN M. WALKER

The Williams and Wilkins Co., 1929

The remaining copies are in the possession of the author who wishes to dispose of them.

Price \$2.00

525 West 120th Street, New York 27, N. Y.

MEASUREMENT OF INDUSTRIAL AND COMMERCIAL EMPLOYMENT IN THE UNITED STATES*

WALT R. SIMMONS

Bureau of Labor Statistics

The United States has become a land with annual gross national output of nearly \$400 billion; a land in which more than 65 million persons are at work. The already extensive range, scope, and variety of activities continue to expand. To describe this situation analysts seek a common denominator, and find it in the yardstick of numbers of workers employed, classified into appropriate categories.

How employment is *measured* is the subject of the following paragraphs. More specifically, only the most extensive and detailed of the several systems for measurement of employment in certain sectors of the American economy is treated in the present paper. This is the joint Federal-State program on which the nation relies for its current detailed industrial data on employment for the country as a whole, for each State and for 150 major metropolitan areas. This program of Federal-State cooperation was launched by the Bureau of Labor Statistics 40 years ago, and is operated today, in a much expanded form, as a joint undertaking of the U. S. Department of Labor and 50 affiliated State agencies. At the Bureau of Labor Statistics it is called the 790 Program, after the form number on which current data are collected. The activity also is designated the CES Program, which is alphabetical shorthand for Current Employment Statistics.

Objectives, Standards and Principles of the Program

The second report of the Bureau of Labor Statistics, founded in 1885, was a study of employment—specifically of convict labor—and was made at the direction of Congress. Since that day, Congress, labor unions, management groups, defense agencies and many other organizations have turned to the Bureau repeatedly for measurement of a wide variety of phenomena in the realm of manpower and employment, and especially of series which measure employment, hours and earnings in a manner which guarantees that these series are continuous over time and thus are utilitarian economic indicators. The objectives, the methods used, the definitions of items measured also have varied widely. This variety in several dimensions is stressed because formulation of the basic objectives and concepts of the program and understanding of those objectives and concepts is considerably en-

hanced when it is realized clearly that the program as it operates today is an evolutionary product, the result of 40 years of development preceded in turn by intermittent studies over another 30-year period. The evolutionary process has left in the program a few outmoded characteristics and anachronisms—e.g., data on earnings exclude certain classes of “non-production” workers—but it also has provided deep roots, time-tested procedures, great vitality and valuable assurances of the essential correctness of much that is done.

Since I wish to deal in this paper with methodology rather than with the many purposes for which the data are assembled, I shall say simply that today the primary objective of the BLS 790 Survey is to obtain current monthly measures of employment, average hourly earnings of workers, average weekly earnings, and average weekly hours of work for the non-agricultural economy of the United States.¹ Estimates are produced for selected individual industries—such as retail clothing stores or the manufacture of aircraft—and for groups of industries such as manufacture of transportation equipment or all-manufacturing. Further, estimates are issued for the U. S. as a whole, for each State and for each major metropolitan area. A secondary but still major use of the survey is to provide a vehicle for the occasional collection of related manpower data, such as, for example, the number of engineers employed, or the number of manhours of overtime paid for.

The survey contributes information on the *level* of items which it measures, but first consideration is given to *trend* of measurements and to continuity over time. This point is emphasized further when we look in more detail at the estimating procedure which is used.

Somewhat separate from end objectives, but interwoven with them, is a group of statistical standards and principles which shape the main outlines of methodology in the 790 Program, and which influence most of the day-to-day decisions that are made. Like the program itself, these standards and principles have evolved gradually. There probably is no unique list of the leading principles. I shall include five in my list.

* Revision of remarks at the annual meeting of the American Statistical Association in New York, December 28, 1955.

¹ It is significant that the same questionnaire is used for collection of hours and earnings, as well as employment. The very definition of employment is conditioned by this fact, and the related fact that data on all three come from the payrolls of business establishments.

Quality. Ever present in planning and in operations is the effort to secure a quality product. Quality is almost always partly a function of cost and tends to be limited by resources. Yet in at least one respect, the standard of quality transcends budget resources. Many times a job has been refused because it was felt that it could not be done sufficiently well with the funds available, and more than once a series of estimates has been discontinued because it had dropped below acceptable standards, and resources forbade improvements. Quality is more than just accuracy. Other facets are reflected in the following principles.

Comparability. To a considerable degree, statistics on employment and earnings are useful only as they are comparable with other similar figures. First consideration is given to internal comparability of parts within the system, but comparability with other systems of economic statistics is also desirable. This means that uniform methods and procedures must be used throughout the system, that common benchmarks, yardsticks, and definitions must be agreed upon, and that standard classifications must be adopted.

Continuity. Continuity is simply comparability over time. It is listed separately because there is no more common watchword in BLS than "continuity". In some circumstances, the cost of maintaining continuity is too great and a break in a series is accepted. But such a course is taken only if the difference in cost is very great. This principle is a dominant one.

Impartiality. The BLS is very jealous of its reputation as an impartial fact-finding agency. Data are never knowingly collected or published in such a fashion that they obscure the real situation. Procedures are under continuing scrutiny lest they violate this principle.

Confidentiality. All reporting under the 790 Program is voluntary on the part of the respondent. Further, if the respondent agrees to cooperate, his report is seen only by sworn employees of the cooperating agencies, is used for statistical purposes only and is published in such a manner as not to reveal information submitted by individual respondents. These twin rules of voluntary reporting and confidentiality do much to promote the quality of reported information.

Program Administration and Organization

The CES program is a joint Federal-State undertaking. Statistical standards, procedures, instructions, coordination and control are established and maintained by the Bureau of Labor Statistics. The State agency carries out the operational steps of sample selection, solicits data from business establishments, edits incoming reports, tabulates the information and issues estimates of employment and earnings for the State and for principal metropolitan areas within the State. Data from the same incoming reports are also transmitted to BLS in

Washington, where they are subjected to quality controls, further processed, and become the materials from which the national estimates are prepared and published monthly by the BLS.

The program is financed largely with Federal funds, although a few of the States make a substantial fiscal contribution. BLS, the Federal Bureau of Employment Security and the State agencies share administrative responsibilities.

Estimating Patterns

Sample design influences choice of estimating techniques in the 790 Program and is in turn influenced by those techniques. The estimating patterns derive also partly from the multi-purpose character of the State-Federal program and from such principles as comparability and continuity noted above.

In order to isolate the estimating pattern and focus light on it, the procedures that are used within a given estimating cell are considered. It is merely noted here that estimates for the various cells are combined in an appropriate way to form estimates for wider categories. The procedures which apply to national estimates will be described. Similar procedures are used by State agencies in preparing estimates for States and for metropolitan areas.

The Estimating Pattern is made up of three themes: the Ratio Estimate, the Benchmark and Link Relative procedure and the Link and Taper Procedure.

To promote comparability and continuity, and to take advantage of efficiencies which result from high correlation of components, ratio estimates are used throughout the 790 Program. Every published figure depends primarily upon the *ratio* of two statistics, each calculated from a matched sample of identical reporting units. In employment series, the ratio is employment for the current month divided by employment for the previous month. Thus, the sample is used directly to estimate *relative change* in employment.

The final estimate of employment uses the Benchmark and Link Relative procedure. In a base month, say, March, the benchmark is set at the level indicated by a complete enumeration. The 790 Sample is used to estimate the change between the base month and the next following month, i.e., from March to April. An estimate is obtained for this next following month (April) by multiplying benchmark by the change—the ratio estimate—obtained from the sample. The estimate for April becomes a new base, which is multiplied by the sample-estimated change from April to May to obtain the level for May. The same procedure is used to secure an estimate for each subsequent month. Thus, the sample provides a chained index of relatives. The estimate of employment in any month is the product of this chained index and the benchmark.

In the calculation of earnings, again ratios are used. For example, in computing average hourly earnings, the first step is calculation of a ratio estimate which is obtained by dividing sample estimates of payroll by matched sample estimates of manhours.

The first ratio estimate is then refined through a method called the Link and Taper Procedure. This is a device which makes the published estimate a weighted average of two component estimates.

A first estimate of average hourly earnings for the current month, u_1 , is obtained by dividing sample estimates (aggregates) of payroll by matched sample estimates (aggregates) of manhours. Similarly, a tentative estimate of average hourly earnings for the previous month, u_0 , is obtained. The values u_0 and u_1 are calculated from matched samples of identical respondents in the two adjacent months. Hence, $\frac{u_1}{u_0}$ is a measure of relative change or $(u_1 - u_0)$ is a measure of absolute change between the two months.

Note is next taken of the *published* estimate of average hourly earnings for the previous month, say v_0 . Because the total panel of establishments reporting in the sample is not perfectly rigid or fixed from month to month, there may be some small differences between v_0 , the published figure for the previous month, and u_0 , the tentative estimate for the previous month obtained from the sample of reports which are matched with reports for the current month. A final figure for the current month is obtained by making use of both pieces of information; the estimate is

$$v_1 = (0.9 v_0 + 0.1 u_0) + (u_1 - u_0).$$

Thus, the Link and Taper Procedure, reflected in this last equation, accepts the advantage of continuity from linking (or use of matched samples), and at the same time tapers or wedges the published estimate toward the level of the latest sample. The Link and Taper method is used also in computing average weekly hours of work, and ratios of production workers and total employees. Several variants of the above equation have been used since the Link and Taper Procedure was first adopted in 1949. The basic principle has remained unchanged.

The Benchmark

The benchmark is a control or base number to which other estimates are tied. It is used *in lieu* of a universe total, which is rarely known in social statistics, and which sometimes can be defined only in terms of expressions created just for the purpose.

The CES system adjusts annually to new employment benchmarks. The benchmark is the average for the first three months of the year of the "best" total counts or estimates which can be obtained, after those figures have been edited for consistency, and in some cases adjusted for closer comparability with previous benchmarks. The

determination of what figure is "best" depends upon a good many factors. Pragmatic interpretation is reflected in the choice of data which are in fact used. Currently, the following sources provide basic data, in the proportions indicated, from which the 790 employment benchmarks are constructed.

<i>Source</i>	<i>Percent of total Benchmark</i>
ALL SOURCES	100%
State Tax Returns for Unemployment Insurance	73
Federal FICA Tax Returns (Old Age and Survivors Insurance)	7
State and Local Governments (Census Bureau)	9
Federal Government (Civil Service Commission)	5
Interstate Commerce Commission (Railroads)	3
Miscellaneous (American Hospital Association, National Catholic Welfare Conference, U. S. Office of Education, National Income Division of U. S. Department of Commerce)	3

The Federal FICA Tax Return is used in selected industries for small firms which are covered by that tax but which are not covered by the unemployment insurance (UI) tax. Beginning in 1956, changes in UI coverage will increase the proportion of the total benchmark accounted for by the UI tax return to 76 percent and reduce the FICA portion to 4 percent.

The above proportions vary, of course, from industry to industry. For example, in the Service industries, the UI coverage currently is 57 percent, in Trade it is 84 percent and in Manufacturing 99 percent.

Sample Design

The 790 Sample is a cluster sample in which the primary sampling unit is the business establishment, and in which there is no subsampling of workers within the clusters. All workers in the chosen clusters are a part of the sample. The nature of the CES Program has led to a sample design which is simple in concept, and unusual or perhaps unique in its details.

For any category for which an estimate is to be published, the design is that of a Modified Cut-off Sample. All establishments in the universe are listed in sequence by number of employees. A "cut-off point" in terms of number of employees in an establishment is selected. The central characteristic of the design is inclusion in the sample of all establishments above the cut-off point, and none of those smaller firms below the cut-off.

The simple cut-off procedure is modified in two significant respects: (1) In principle, the cut-off selection is applied independently for each category for which an estimate is to be published, whether it be a local, State, or national estimate, and whether it be a major, minor,

or intermediate industry. The operating rule is to include in the sample for a particular category all those establishments which carry the classification of that category, without regard to whether the establishment was originally selected for the specific purpose of making estimates for that cell, or for the purpose of making estimates for a related cell. This means, for example, that the entire sample is used in preparing national estimates, though parts of that sample were originally solicited for use in preparing estimates for a particular metropolitan area. (2) If an establishment above the cut-off point refuses to cooperate, the next largest plants immediately below the cut-off are solicited as replacements. The general design just described is certainly not appropriate for all industries—for example, building construction, and barber shops. In these, and a number of other industries, special designs and procedures are used.

Whether the general design is best among possible alternatives for most industries is a question under constant investigation at BLS. The present brief article can but touch upon research activities which are aimed at testing and improving sample design. These activities include tests of differing stratifications (e.g., by geography, by size-of-firm, by class-of-worker, by varying industrial detail); tests of bias caused by reducing or eliminating reports from smaller establishments, several methods of estimating volume of employment in new business births; and numerous synthetic estimating devices—e.g., estimating employment in a given industry by a regression relationship with data which can be obtained more readily than can employment data in the given industry.

Research includes both extensive study of probability designs in the form of models, and experiments with these designs under operating conditions. Probability sampling is the only known discipline for conducting a partial survey for which there exists an adequate conceptual foundation and associated theory which permits rational and efficient use of resources at the command of the organization conducting the survey. A probability design permits evaluation of results in the sense that measurement can be made, in objective terms, of the degree of confidence which should be placed in the proposition that the sample adequately reflects the universe (as it would be described through complete enumeration). Many other advantages of probability designs are well-known. For example, they make possible the comparison of efficiencies of alternative plans; they facilitate the measurement of bias; they establish a framework within which the impact of non-response can be evaluated; and they usually lead to a sharpening of definitions and procedures. Probability designs justifiably carry with them a prestige which contributes to the acceptability of the results of a survey.

For a survey of the general type of the CES program, however, not all the evidence favors a complete use of

probability designs. Prominent among this evidence are three considerations: (1) Since the CES program produces estimates for many different industries and many different areas monthly on a very tight time schedule, there is some doubt whether a probability design could in fact be carried out completely at a tolerable cost. (2) The program results in estimates of ratios and trends; all trends of employment are adjusted to annual benchmarks. In any industry characterized by large firms—e.g., the automobile industry—the possible bias of such an estimate obtained from a cut-off design of even a moderate number of cases is less than the variance of a more expensive probability sample. Many U. S. industries are of this type. (3) Actual tests have shown for a number of industries that the optimum probability design results in selecting plants of which more than 60 percent are in fact the same cases found in present 790 samples. The overlap of the two types of sample in terms of employees is frequently 80 or 90 percent.

The writer is an ardent advocate of probability sampling, and is in an unaccustomed role in pointing to advantages of nonprobability techniques. I must say, however, that the degree to which probability designs should be introduced into the CES program is not yet clear.

Statistics and Dynamics of the Sample

The 790 sample is, I believe, the largest monthly sampling operation in the field of social statistics. It consists of 110,000 reporting units which cover 155,000 establishments and 16,000,000 employees. In terms of numbers of establishments, the sample ranges from a fraction of one percent of the universe in some service industries, to 100 percent in some heavy manufacturing industries. The overall average sampling fraction is approximately 1-in-20. The average for the more volatile division of manufacturing industries is about 1-in-6.

As a consequence of the sampling pattern, which emphasizes large establishments, the percent of coverage in terms of number of workers or dollars of payroll is much higher. The overall measure by this criterion is about 2-in-5, or 40 percent. For the entire manufacturing division it is 68 percent, and for a number of individual industries, the sample includes over 90 percent of the workers in the universe.

National estimates are aggregated from 353 separate industry strata.

The 790 sample is not a fixed, unchanging panel of reporters. In recent years, there has been an annual average of 10,000 new reporters while some 6,000 a year have been dropped. Another 1,500 are shifted from one industry to another each year.

One more statistic associated with the 790 Sample must be quoted—a striking figure. More than 13,000 distinct estimates are produced each month from the data contained in the 790 reports, and are molded into as many time series.

Editing and Computation

In earlier years, all 790 schedules came to Washington, either through the State agency or direct from the respondent, where they were edited or re-edited. This phase of the operation has changed. Now it is more in the mold of quality control, and is carried out largely by electronic computers and conventional punch card equipment. A description of the procedure has been published elsewhere so that only the barest outlines of the procedure need be noted here.² For any given statistic, say average hourly earnings in a specified industry, a study of the frequency distribution of plants by size of the statistic reported indicates the range within which reported data (after editing in the State agency) are probably correct, and outside which they should be questioned. The machines are advised as to what tolerances are acceptable, both in terms of level and change from previous month. They are then instructed to review each schedule, compare it with data for the same schedule for the previous month, set aside schedules which are outside tolerances, and calculate industry averages for

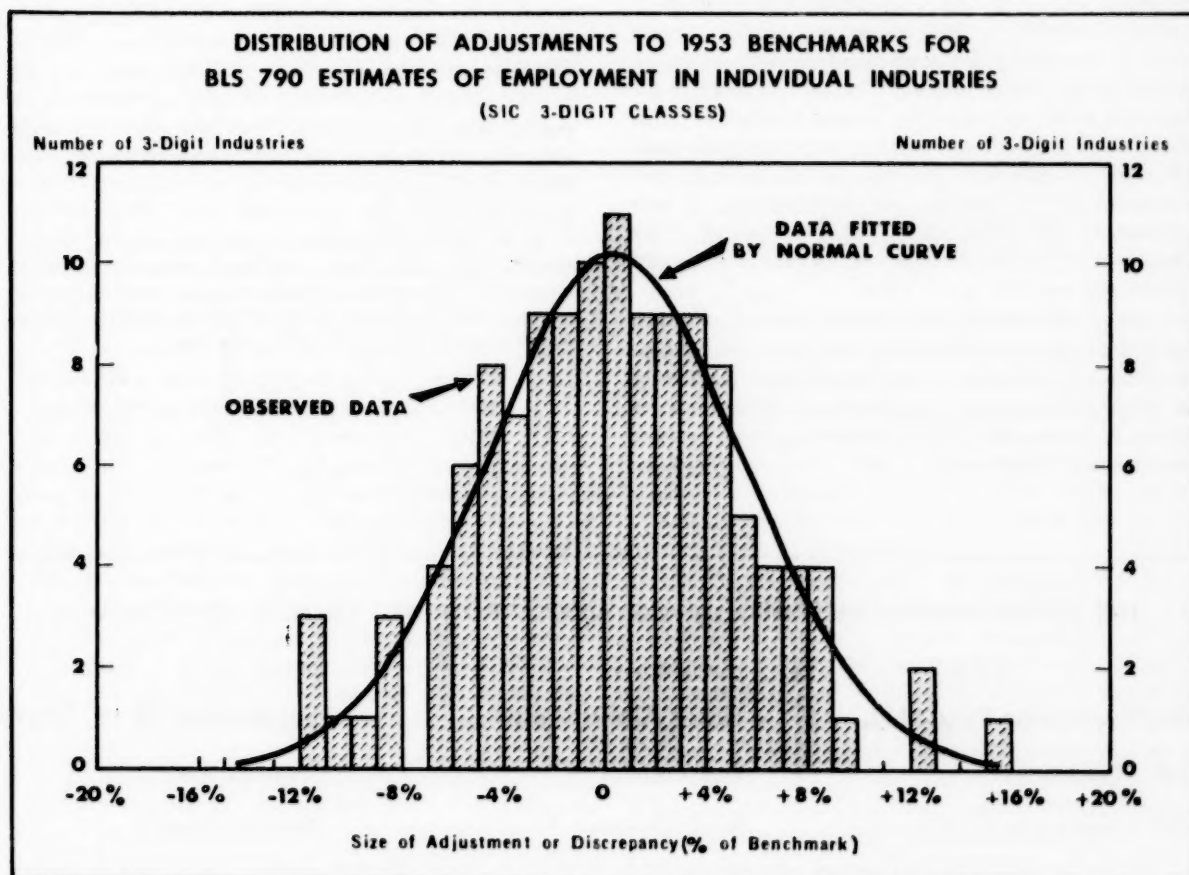
² *Monthly Labor Review*, Vol. 78, No. 5, May 1955, U. S. Dept. of Labor, Washington, D. C.

those which have passed the testing circuits. Listings of data for the cases which were outside tolerances are passed to expert reviewers, who study each case individually. They decide whether to accept the doubtful data, correct the report, or seek an explanation from the respondent by way of the State. Programming has been completed whereby the initial machine averages will be used for preliminary press releases. The results of the review of cases outside tolerance limits are later fed back into the machines and included in final estimates.³

Precision of Current Employment Estimates

In most statistical surveys, final results are subject to potential errors of two kinds: sampling errors and errors of measurement. The first of these two is an expression of the degree to which estimates from the sample differ from corresponding characteristics of the population purely as a consequence of the fact that the sample does not include all units of the population and may, in a given instance, be imperfectly representative of the population. The second type of error, measurement error, is

³ Some of the larger States are introducing somewhat similar machine processes into the initial editing of schedules and the preparation of State and area estimates.



the resultant of a host of components: variability and biases arising from ambiguous definitions, inaccurate response or recording of response, non-response, mistakes in classification, editing, tabulating, or other processing, logically biased estimating formulae and other sources.

If the survey rests on a probability sample, there is at our disposal a most satisfactory body of theoretical knowledge for evaluating sampling error. The development of models and associated procedures for evaluating measurement errors is much less well developed. In fact, this situation is so pronounced that in the literature today the expressions "specifications for accuracy" and "precision" of a survey usually refer to sampling error alone, and omit from consideration the measurement error.

In the last few years in the employment program, there has been an effort to place the measurement of precision on a more orderly and less subjective basis than in earlier years, and to assess total error, in contrast to sampling error alone. I wish to preface a brief description of efforts in this direction with the caution that we have gone but a very short distance up a long road.

Beginning with data for 1953, precision and specifications for accuracy of estimates of employment have been measured in units of root-mean-square-discrepancy (RMSD). RMSD is the square root of the average squared discrepancy for a group of industry estimates, the discrepancy being measured for each industry as the deviation of the estimate from its new benchmark. It is thus a statistic which encompasses on a pragmatic basis all types of difference between current estimate and benchmark, both sampling and non-sampling. It is a measure of total error except for that class of errors which are identical mistakes in sample and in the benchmark.

Employment estimates for national totals are published for 132 separate manufacturing industries (SIC 3-digit classification). This is a sufficiently large number of moderately homogeneous observations to permit analysis of the frequency distribution of discrepancies between estimates and benchmarks.

In 1953, the benchmark adjustment occurred after a 2-year interval from the last previous adjustment. Suppose the discrepancy is measured as final current estimate minus benchmark, with all discrepancies expressed in relative terms. The mean value of the discrepancy for all industries was a negative 0.4 of one percent. The RMSD was 5 percent. The frequency distribution of discrepancies was bell-shaped, and is in fact fitted nicely by the Gaussian normal curve, as can be observed in the accompanying chart.

Adjustment to 1954 benchmarks reflected a one-year interval following previous adjustment. For 1954, the mean discrepancy is 0.2 of one percent, and the RMSD is 3 percent. For 1955 adjustments, the mean discrepancy is again 0.2 of one percent and the RMSD is again 3 percent.⁴

The 790 Research Program

Research continues on almost every aspect of methodology which has been mentioned in this paper. Perhaps first attention is being given at present to analysis of response through intensive interviews with a subsample of respondents. This is one part of a special effort which will be made over the next few years to bring closer together the concepts of employment statistics and the numbers which are reported by respondents. The research program has been in the past few years, and will be, augmented considerably by the contributions of participating State agencies. This was not the primary objective, but is one of the real benefits of Federal-State cooperation.

⁴ In the calculations of RMSD in each of the years, 4 of the 132 industries were omitted from calculations, either because the industries were very small, or because the reason for the discrepancy was particularly uncommon. If all 132 industries had been included in computations, the results would have been:

<i>Year</i>	<i>RMSD</i>
1953	6%
1954	4
1955	4

THE FUTURE ANNUAL MEETINGS OF THE ASSOCIATION WILL BE HELD AS FOLLOWS:

1957	Headquarters	Dates
1957—Atlantic City, N. J.	Hotel Ambassador	September 10-13, 1957
1958 — Chicago	Hotel Congress	Christmas Week
1959 — Washington, D. C.	Hotel Shoreham	Christmas Week

We want to talk a little about math and statistics. We've been in the editorial game for so long that we might have difficulty in some of the simplest problems in integration and differentiation, but our math is good enough to show us that if you keep adding isolated figures from here and there it is possible to come up with a significant total.

What is all this about? Simply this: Math and statistics are here to stay, and by *here* we mean in I&EC as well as in the general world of chemistry and chemical engineering. But many chemists and chemical engineers don't seem to believe it. This may be because they are afraid of numbers. It may be because they don't see how math can substitute for a pipe wrench or the actual working out of a problem with materials and equipment. It may be because they have been "burned" through misuse of statistics. Whatever may be the cause, we believe they are wrong.

The picture isn't black, of course. In contrast to complaints (and from a chemical engineer, too), such as we received a few weeks ago about the number of pages of math devoted to a study of fixed and moving beds, are such heartening instances as the many write-ins on reader questionnaires about the value of an article on application of matrix mathematics to chemical engineering problems, and the many readers who indicate that we have too few mathematical and statistical studies, rather than too many.

Perhaps we should not be discouraged, but sometimes we are. A little more than a year ago, I&EC's editors invited Jack Youden, one of the country's authorities on statistical design to become a contributing editor. We felt that statistical design was still a very new subject to the chemical industry, and that we would like to be among the first to promote its use. The response to Dr. Youden's bimonthly column "Statistical Design" has been more than gratifying, to us and to him. And yet, we feel that the surface has only been scratched as far as I&EC's readers are concerned. In our eagerness to get the practical aspects of statistical design to our readers as quickly as possible, we wanted Dr. Youden to devote a couple of columns to setting the stage, and then launch immediately into case histories. This, he was somewhat reluctant to do, because he felt that a solid foundation was necessary—statistical design is a treacherous tool when used improperly. It is like the best paint that a manufacturer can put on the market—if the customer doesn't know how to use it, or doesn't follow directions, the results may be

poor, and it is the *paint* and the *manufacturer* that the customer blames, not his own ignorance or carelessness.

Dr. Youden was right. Even though he now plans to emphasize the specific practical problems which statistical design can help to solve in plant and laboratory, we find ourselves leaning a little bit toward more fundamental material to be sure that the groundwork is properly laid. Why do we feel this way now? ISEC, with the other applied journals of the AMERICAN CHEMICAL SOCIETY, is privileged to be able to draw on the services of more than 3000 reviewers to aid in the careful and competent evaluation of the manuscripts submitted for publication. Yet too often we receive review replies in this vein: "I have examined the manuscript carefully. The subject matter is of great interest and should be published. The experimental evidence appears to be valid. However, I am not qualified to judge the mathematical (or statistical, as the case may be) treatment, and I suggest that you ask a statistician to examine the material."

And we have had some strong arguments in the past year between reviewers and authors of statistical articles—some the result of misunderstandings, but some caused by *faulty* understanding of what statistics can and cannot do, or the desire to jump quickly on the bandwagon and use statistics as a panacea for all problems.

The remedy, of course, is more statistics, not less, understood by more chemists and engineers. It lies in more programs, more lectures, more time spent in learning what statistics can do. Just about the time this issue of ISEC is being mailed, an Engineering Statistics Institute will be underway at the University of Wisconsin. This program will be divided into three parts: fundamentals of statistics, decision making, and design of experiments. Each session will have a work shop on industrial problems. The short statement in the announcement is worth quoting for the unbelievers: "The use of statistical techniques for the evaluation of data, for making decisions, and for designing experiments is rapidly becoming another powerful management tool. When properly used, they may save money and valuable time. . . . Test engineers, research engineers, process engineers, and research personnel will be particularly interested."

We have a deep suspicion that many engineers feel the use of statistics beneath their dignity as engineers. A few months ago, we sat in the office of a respected chemical engineer in a large company. He was in a neat business suit, and there were no evidences of the usual engineering tools around—only a couple of blackboards. We sat fascinated for an hour, however, with his simple explanation of how he and a group of others were using statistical design methods to decide the feasibility of many engineering and manufacturing problems, to his company's great satisfaction and financial gain.

* This article appeared as an editorial in *Industrial and Engineering Chemistry*, March, 1956. It is reprinted here at the suggestion of Dr. Churchill Eisenhart who indicates, "... the appearance of such an editorial in this particular technical journal should be regarded, I believe, as a milestone in the progress of statistical methodology."

QUESTIONS AND ANSWERS

Edited by ERNEST RUBIN
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and American University*

Statistics for the General Reader (and Others)

An increasing interest in statistics by the public has developed because statistical techniques, devices, methods, and machines are referred to daily in our press and in other forms of communication. Consumer surveys, political polls, index numbers and escalator clauses in wage contracts, correlation between smoking and cancer, graphic displays and the so-called giant brain machines and computers have dramatized modern statistical growth. As a result statisticians and teachers are frequently called upon to answer the following question or its equivalent: "Can you recommend a book on statistics (I have practically no mathematics background), that will give me a general idea and appreciation of this subject?"

In preparing an answer to this question I examined books and articles in the statistical field, covering the period 1900 to 1956, and I asked a number of teachers and statisticians for their opinion on this question. Our opinion is that Tippet's short book¹ is the best single work for the general reader. This volume was first published in 1943 and has been reprinted several times. It introduces the fundamental concepts of statistics with great clarity and discusses the relation of statistics to science and society. Tippet's volume is an excellent supplement to the statistics textbooks used in elementary courses. Furthermore, the mature statistician and specialist may also read this book with enjoyment and enlightenment.² A very readable companion is the volume *How To Lie With Statistics* by Darrell Huff³ which contains amusing illustrations and examples in the practice of fallacies which depend on statistical props. These books contain no algebra or complicated formulas and require an understanding only of arithmetic in daily use; they do not contain problems, examples or exercises.

In addition to the general reader who desires a more-or-less popular exposition, there are others who prefer a

textbook introduction to elementary statistics. The intent of most of the members in this group is to "do-it-yourself", i.e., to teach yourself the subject matter and do the problems at the end of each chapter. This group generally consists of persons who have had at least some mathematics beyond the elementary school level.

Several hundred textbooks have been published in English that deal with elementary statistics. The classic textbook by G. Udny Yule and M. G. Kendall, *Introduction to the Theory of Statistics*⁴, has, perhaps, a special appeal to persons interested in the theory of the subject. It is not an easy work, and therefore does not lend itself readily to the "do-it-yourself" approach. For this reason I hesitate to recommend it although it is an excellent text and reference book. Unless an author has in mind the possible use of his book as a self-teaching manual and writes and plans his work accordingly, the book will contain many gaps that a beginner cannot bridge. A self-teaching book must be written on the assumption that there is no instructor to explain material that is assumed or otherwise omitted.

A popular work which undertakes to be a self-teaching manual as well as a textbook is *Facts From Figures* by M. J. Moroney.⁵ It also contains hints to the solution of the problems, as well as answers to these problems. In a recent text, *Statistics: A New Approach*, by W. Allen Wallis and Harry V. Roberts⁶ a practically non-mathematical treatment of statistics has been developed. A "Do It Yourself" section concludes each chapter. This volume contains several hundred analyzed examples from many fields and is well written, stimulating, and highly interesting. While no answers are provided for the "Do It Yourself" examples, the many illustrative problems aid in suggesting solutions.

For persons who wish to consult briefer references, the following are of interest and value:

- (1) Morris R. Cohen and Ernest Nagle, *An Introduction*

Continued on page 23

¹ L. H. C. Tippet, *Statistics* (London, Oxford University Press, 1956), pp. 224.

² An earlier work, though now somewhat out-of-date, is *Primer of Statistics* by W. P. Elderton and E. M. Elderton (London, Black, 1920), first published in 1909 and later revised in a number of editions. It is a readable and clear approach to elementary statistics.

³ (New York, Macmillan & Co., 1954) pp. 142.

⁴ (Revised edition, London, Charles Griffin & Co., 1954).

⁵ (Third revised edition, Pelican Books, 1956) pp. 472.

⁶ (Glencoe, Ill., The Free Press, 1956), pp. 646.

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TEACHING INTRODUCTORY STATISTICS IN THE LIBERAL ARTS CURRICULUM

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DOUGLAS M. MORE

McMurray-Hamstra and Company
Chicago, Illinois

Everyone who has taught a course in introductory statistics to majors in sociology, psychology, education, and the like has been faced by the Great Panic Reaction. In another course the instructor can say, "The occupational system is essentially the institutionalized differentiation of the adaptive aspect of the task-orientation area of the social system,"¹ and be met with only a soft murmur of discontent. Yet, at the mere mention of the number "three," student apprehension will rise to the panic level. Voicing an expression like "sigma-ex" will lead to a barrage of drop-slips and changes-in-major. Something in our cultural background seems to engender these anxieties; at some time in our formative years we are frightened by the magic of numbers. Genuine learning cannot take place in an atmosphere fraught with anxieties, and the fears must be allayed before students can attend to subject matter. And so the teacher—if he is to teach at all—must be concerned first with the fear and only secondly with the subject matter of statistics. He must be a religious confessor, a psychotherapist, and a numbers magician all rolled up into a neat package.

It is not the intent of the present paper to explore the basis for the Panic Reaction. That is a problem for research in educational psychology and sociology. Rather, we hope to outline a device which may help to allay the anxiety. We are convinced that much of the fear engendered by a first experience with statistics may be eliminated by sound, systematic, and logical course organization. We shall present a plan—a course outline—designed to provide such an order. It is hoped that through the application of such a plan introductory statistics may become a tolerable, perhaps desirable, course in the liberal arts curriculum.

I

Most introductory statistics texts, and we may suspect, most introductory courses, are organized along a standardized plan.² Such uniformity is beautifully illustrated by the small table of "concordances" between texts given

¹ Talcott Parsons, Robert F. Bales, and Edward A. Shills, *Working Papers in the Theory of Action*, Glencoe, Illinois: Free Press, 1953, p. 255.

in the opening pages of the College Outline Series, *Statistical Methods*.³ The student is first introduced to the statistics of measurement. He is exposed to the frequency distribution and then to the several measures of central tendency and variability. This is usually followed by discussions of sampling and the normal curve, and this in turn by the product-moment correlation coefficient. Then, the remainder of the course usually is taken up with discussions of other estimates of correlation and various tests of significance. These "tag-end" devices are often presented in a rather arbitrary, even haphazard, order.

Such a standard course plan leaves something to be desired. It requires that the student memorize a large number of seemingly unrelated rules and formulas. It presents little overall logic—no general organizational plan. The only order may result solely from the desire of the instructor to introduce the various statistics according to their computational simplicity. In other instances, an attempt is sometimes made to reproduce them in the order of their invention. In either case, this results in a rather haphazard presentation, and requires that any additional organization be imposed by the student.

Such methods have great potentialities for raising anxiety. Presented in this fashion, statistics appears to be a morass of mathematical trivia designed primarily as an ordeal for the student. On the other hand, if the student is presented with an explicit statement of the range and logical organization of modern statistics, much may be accomplished toward reducing anxiety. He must understand the role of statistical study in

² For example, see Lillian Cohen, *Statistical Methods for Social Scientists*, New York: Prentice-Hall, 1954; Sanford M. Dornbusch and Calvin F. Schmid, *A Primer of Social Statistics*, New York: McGraw-Hill, 1955; Allen L. Edwards, *Statistical Analysis for Students in Psychology and Education*, New York: Rinehart, 1946; Henry E. Garrett, *Statistics in Psychology and Education*, New York: Longmans, Green, 1947; J. P. Guilford, *Fundamental Statistics in Psychology and Education*, 2nd ed., New York: McGraw-Hill, 1950; Helen M. Walker, *Elementary Statistical Methods*, New York: Henry Holt, 1943.

³ Herbert Arkin and Raymond R. Coulton, *Statistical Methods*, 4th ed., rev., New York: Barnes and Noble, 1950, pp. xi-xiii.

scientific investigation, the types of problems which may be solved through the application of statistics, and the ways in which statistics can contribute to such solutions. The outline which follows presents a logically coherent organization of elementary statistical thought.

II

Our proposed outline describes the division of a course into four basic sections. The first of these is introductory. It is designed primarily to familiarize the student with the place of statistics in research and in science generally. The other three basic sections deal with classification, ranking, and measurement, respectively. This division reflects the assumption that one fundamental organizational principle for statistics may be found in the nature of the data available to an investigator. Each of these three sections is then divided into two sub-sections, one dealing with description, and the other with analysis or the statistics of relationship. Here it is assumed that having solved the problem of the nature of the data, the next logical question is concerned with the type of study planned. Is it the intent of the research to describe discrete phenomena, or is it concerned with problems of relationship?

One further division runs throughout the outline. Each of the analytic subsections is divided into one segment concerned with expressions of the degree of association, and another on tests of significance of association. This division is designed to express the choice which exists for the investigator between estimating the degree of association, or testing merely whether or not association exists at all. These divisions are made explicit in the outline below.

It will be apparent that the outline below follows systematically the proposition of modern pedagogy that learning takes place best whenever specific applications flow within a broad, theoretical framework. We do not hold with some post-Deweyian educators who propose to let principles emerge from a planned plethora of specific applications. It is especially in statistics that such an approach will not work, because each new application serves merely as another straw of irritation to the already number-panicked student. Reduction of this fear can best come through knowledge and understanding of *why* operations are required—not through piecemeal acquisition of rote-memorized formulas and their equally piecemeal applications. Such a program as we suggest is obvious in the general structure of our outline—proceeding from general to specific. We also feel it is desirable to follow the same program implicitly within the presentation of each of the “applied” sections and subsections.

III

Outline of a Course in Introductory Statistics

Section I. Introduction—Statistics and Science.

A. Theory and Science.

1. Intuition or logical deduction?
2. Regularities of relationships between events.
3. Additions to knowledge—discrimination of differences.
4. Theory—axioms, generality, parsimony.
5. Creating testable hypotheses.
6. Distinguishing general and singular propositions.
7. Specification of formal relationships.
8. Operations as definitions.
9. Constructing verifiable assertions.

B. Planning Research.

1. The role of informal hunch, guess, or insight.
2. “Importance” of the question posed.
3. Flexibility and rigidity in planning.
4. Collecting data—exigencies of time, finances, sufficient data, peripheral extras.
5. Priority of a framework for analysis—use of adequate categories.

C. The Place of Statistics in Research.

1. Statements of relationship are statistical.
2. Descriptive and analytical statistics.
3. Types of variables.
4. Classification.
5. Ranking, scaling, and measurement.

D. Statistical Generalization.

1. Sampling.
2. Concepts of adequacy and representativeness.
3. Generality of propositions as determinant of sampling.
4. Statements of degrees of association.
5. Statements of probability—significance of association.
6. Inference—Bayes’ theorem.

Section II. Classification.

A. Descriptive Classification.

1. Classes.
2. Types.
3. Percentages and proportions.
4. Graphic presentation.

B. Analytical Classification — Expressions of Association.

1. Phi point correlation.

2. Q -coefficient of association.
 3. C , coefficient of contingency.
 4. Tetrachoric correlation.
- C. Analytical Classification — Tests of Significance.
1. Chi-square.
 2. Standard error of Q .
 3. Standard error of tetrachoric r .

Section III. Ranking.

- A. Descriptive Ranking.
1. Principles of scaling — classes to ranks.
 2. Thurstone and Likert scaling.
 3. Guttman's Scalogram analysis.
- B. Analytical Ranking—Expressions of Association.
1. Rho.
 2. Tau.
 3. W , coefficient of concordance..
- C. Analytical Ranking — Tests of Significance.
1. Standard error of rho.
 2. Standard error of tau.
 3. F -test for W .
 4. Analysis of variance by ranks.

Section IV. Measurement.

- A. Descriptive Measurement.
1. Mean.

2. Median.
 3. Mode.
 4. Standard deviation.
- B. Analytical Measurement—Expressions of Association
1. Zero-order r .
 2. Bi-serial and point bi-serial r 's.
 3. Flanagan's method.
 4. Multiple R .
 5. Partial r .
- C. Analytical Measurement — Tests of Significance.
1. Standard errors for measures of association.
 2. t -tests.
 3. Analysis of variance with R .

IV

The present report has described and outlined a plan for organizing a course in introductory statistics in a liberal arts curriculum. The organization here described is based upon an attempt to place statistics in the larger perspective of the research activity. Such a course will describe the range and applicability of modern statistical devices. It will provide the student with answers for the questions: "What can statistics do?" and "How can it do it?" It is hoped that such an explicit statement of the place of statistics in research will help to allay the anxiety of the introductory student and thus to enhance the learning process.

ELECTION OF NEW FELLOWS

At the 116th Annual Meeting of the Association in Detroit the Committee on Fellows, composed of A. Ross Eckler, Chairman, Helen Walker, Paul Olmstead, Martin R. Gainsbrugh and Churchill Eisenhart, announced that the following new Fellows had been elected:

FRANCIS J. ANSCOMBE: Formerly University Lecturer in Mathematics at Cambridge University, now Associate Professor of Mathematical Statistics at Princeton University, whose original and important contributions to the theory and practice of sequential estimation, and whose lucid exposition of the statistical principles basic to comparative experimentation, have brought worldwide recognition.

T. A. BANCROFT: Director of the Statistical Laboratory at Iowa State College, who has contributed to the application of statistical method in agriculture and biology both through his own research and through his administration of a great research center, and who has advanced the mathematical theory of statistics both through his own papers and through scholarly textual exposition of the general field.

Z. W. BIRNBAUM: Professor of Mathematics and Director of the Laboratory of Statistical Research, University of Washington, author of many important papers on statistical theory, whose original contributions to the theory of distribution-free tests have greatly accelerated the adoption of minimum-assumption techniques in statistical practice, and whose numerical tabulation of the distribution in small samples of Kolomogoroff's test function has made its use feasible in practice.

DONALD J. BOGUE: Associate Professor at the University of Chicago, and Associate Director at Scripps Foundation for Research in Population Problems, whose statistical studies have contributed much to our knowledge of the movements of people within the United States, especially to and within metropolitan areas.

LEE J. CRONBACH: Professor of Education in the University of Illinois, President of the American Psychological Association, who displays continual vigilance for the appropriate use of existing statistical techniques in education and psychology and continual zeal in pointing out areas for which no existing techniques are appropriate.

GROVER W. ENSLEY: Executive Director, Joint Economic Committee, for his leadership in a strategic position toward better and more current government statistics; for providing a public forum through annual hearings involving the presentation of statistics on the role and economic impact of government policies; also, a pioneer in the development of the nation's economic budget as an analytical tool.

LEO A. GOODMAN: Professor of Statistics and Sociology at the University of Chicago, whose publications include notable contributions in the fields of integral equations, decision theory, estimation, non-parametric tests, urbanization and ecology.

C. HORACE HAMILTON: Chairman of the Department of Rural Sociology at North Carolina State College, and former President, Rural Sociological Society, who through research and teaching has been a leader in the application of more rigorous statistical methods to the study of rural society.

PALMER O. JOHNSON: Professor of Education at the University of Minnesota, director or consultant on many research commissions, for his service in acquainting educators with statistical techniques developed in many other fields, through numerous papers in educational journals summarizing current statistical developments and through his series of three well-known texts on statistics.

ROBERT E. JOHNSON: Economist and Actuary, Western Electric Company, for the application of statistical principles and techniques to business problems; for developing programs designed to improve the level of literacy of statistical assistants in industry, and for his untiring efforts on behalf of the Association, particularly in regional and section activities.

LEO KATZ: Associate Professor of Statistics at Michigan State University, author of a number of papers on statistical and mathematical theory, who in addition has worked on statistical problems arising from the study of social groups, particularly in the analysis of personal choices.

MRS. KARIN KOCK: Director in Chief of the Central Bureau of Statistics in Sweden, for leadership, for major contributions to the improvement of government statistics in her country, and for contributions to many international conferences in the field of statistics.

PAUL F. LAZARSFELD: Chairman of the Department of Sociology at Columbia University, and Associate Director of the Bureau of Applied Social Research, for many years of outstanding service in the field of social psychology, where he has distinguished himself in the use of statistical techniques, and has gained recognition as a discerning analyst in such a currently important field as voting behavior.

ERICH LEHMANN: Professor of Statistics, University of California, distinguished former editor of the *Annals of Mathematical Statistics*, who has contributed an unusually large fund of productive ideas to the statistical theory of estimation and testing hypotheses, and particularly to the new field of non-parametric methods.

GEOFFREY H. MOORE: Associate Director of Research, National Bureau of Economic Research, internationally known for his work in the field of business cycles, and for the development of such new analytical tools as statistical indicators of revival and recession and, most recently, of measures of diffusion; also for his activity in the Association's sectional and national meetings.

CALVIN F. SCHMID: Director of the Office of Population Research at the University of Washington and Chairman of the Washington State Census Board, for his long and successful service in stimulating the use of State and local data and for his outstanding work with the Washington State Census Board.

ROBERT L. THORNDIKE: Professor of Education in Teachers College, Columbia University, eminent psychologist, who by his writing, research, and activities as president of two national associations concerned with the statistical analysis of psychological data, has exerted a potent influence on the use of statistical methods in test construction and in vocational selection and prediction.

QUESTIONS AND ANSWERS—Continued from page 18

to *Logic and Scientific Method*,⁷ Chapter XVI, "Statistical Methods", pp. 302-322. Also of related interest in this text are Chapter XIV, "Probability and Induction," pp. 273-283, and Chapter XV, "Measurement," pp. 289-301.

- (2) M. G. Kendall, "The Statistical Approach", *Economica*, May, 1950, Vol. XVII, No. 66, pp. 127-145. (Inaugural Lecture given at London School of Economics, January 17, 1950).

- (3) Jerome B. Cohen, "Misuse of Statistics," *Journal of American Statistical Association*, December 1933, Volume 33, pp. 657-674.

- (4) Morris R. Cohen, "Statistical View of Nature," *Journal of American Statistical Association*, June 1936, Volume 31, pp. 327-346.

The foregoing references are given as suggestions. I expect that I will be criticized for some of these selections as well as for certain omissions. I would appreciate additional references and suggestions that may be used in a subsequent discussion.

⁷ (New York, Harcourt, Brace & Co., 1934), pp. 467.

NEWS ABOUT MEMBERS

Roy L. Adams' new position is that of Chief Statistician—Supervisor of Statistics and Analysis Section, Division of Business Administration, State Department of Public Welfare, Columbus, Ohio.

R. B. Ammons will be an Associate Professor at the University of North Dakota and will continue as editor of "Psychological Reports" and "Perceptual and Motor Skills," which have moved their editorial offices to the University of North Dakota. **Sigmund J. Amster** is working toward a doctorate in Experimental Statistics. He has an assistantship from the Department of Experimental Statistics, North Carolina State College.

Oskar Anderson, a Fellow of the American Statistical Association, has been elected an Honorary Fellow of the Royal Statistical Society, London.

W. E. Andrus, Jr. was recently appointed Manager of IBM's Endicott Scientific Computation Laboratory. He was previously Staff Mathematician in charge of the Statistical Section of the Scientific Computation Laboratory.

Sidney Armore, formerly with the Personnel Research Branch, AGO, Department of the Army, has been appointed Chief of the Statistical Services Section, Research and Statistical Services Branch, Office of Education.

George J. Auner is employed as Staff Statistician, Applied Mathematics Section, Technical Services, Jones & Laughlin Steel Corporation, Pittsburgh.

Elliot F. Beideman is now Marketing Research Manager, Computer Systems Division, The Ramo-Wooldridge Corporation, Los Angeles, California. He was formerly Head, Marketing Research Office, Office of the General Manager, Hughes Aircraft Company, Culver City, California.

Robert I. Berg is working for the Council for Economic and Industry Research, Inc. as a statistician and computer programmer.

Charles A. Bicking has taken a new position as Quality Control Manager for the Carborundum Company, Niagara Falls, New York.

Richard S. Bingham, Jr. has joined the newly formed Quality Control Branch of the Research and Development Division of the Carborundum Company, Niagara Falls, New York.

Archie Blake, formerly Advisory Engineer with the Westinghouse Electric Corporation, Baltimore, has accepted an appointment as Systems Staff Mathematician with the Bendix Aviation Corporation in Detroit.

Mark S. Blumberg, M.D., has joined the staff of Stanford Research Institute as As-

sociate Operations Analyst in the Economics Division. Dr. Blumberg was formerly Acting Chief of the Health Conservation Section of the U. S. Public Health Service in Washington, D. C.

Robert F. Boldt has a new position as Research Psychologist in the Statistical Research and Analysis Section, Personnel Research Branch, Adjutant General's Office, Department of the Army.

James L. Broughal, Jr., is now Director of Fund Raising for the New York TB and Health Association, New York City.

E. Douglass Burdick, Professor of Statistics at the University of Pennsylvania, is on a two year assignment as Professor of Biostatistics at the High Institute of Public Health in Alexandria, Egypt. This is part of the I.C.A. program to train 19 types of specialists including medical health officers, sanitary engineers, and biostatisticians in the field of public health.

Noel D. Burleson will be at the London School of Economics and Political Science in African Studies.

Paul B. Carty, 1st Lt. in the U. S. Air Force, is presently serving as Armament Operations Officer for the 40th BWG, 802 AD, at Smoky Hill AFB, Salina, Kansas.

Dean James Clair has accepted an appointment as Instructor in the Department of Psychiatry, Stanford University Medical School. He was formerly an Instructor in the Washington University Medical School, St. Louis.

William S. Connor, a mathematician, has rejoined the staff of the National Bureau of Standards where he will work in the Statistical Engineering Section of the Applied Mathematics Division. Dr. Connor, who was previously employed at NBS from 1951 to 1954, will aid in the section's research on the application of modern probability and statistical methods to the physical sciences.

Thomas F. Corcoran, Chief of the Consultation and Training Branch, Office of the Coordinator, International Statistics, Bureau of the Census, has been on detail to the International Cooperation Administration for a three-month period in Addis Ababa to advise the Ethiopian Government on the organization and operation of their statistical program.

Edwin B. Cox has finished a two-year tour of duty with the U. S. Air Force and has returned to his position as Instructor in the Department of Economic and Social Statistics at the Wharton School of the University of Pennsylvania.

Herbert T. David, Lecturer in the Committee on Statistics of the University of

Chicago, has accepted a position at Iowa State College as Assistant Professor in the Statistical Laboratory and the Department of Statistics for teaching, research and consulting work in industrial statistics.

Willis Davis, formerly with the Ralph M. Parsons Co., is now Research Statistician with the Advanced Development Division of the AVCO Manufacturing Corporation, Bridgeport, Connecticut.

W. R. Davison, formerly Chief of the Analysis Section, Ordnance Ammunition Command, has joined the Quality Control Branch of Phillips Petroleum Company, Rocket Fuels Division, at AF Plant 66, McGregor, Texas.

W. Edwards Deming was awarded the Shewhart Medal for the year 1955 by the American Society for Quality Control. The award was made "in recognition of his many contributions to the science and to the art of application of statistical quality control, his profound influence as a pioneer in teaching the methods of quality control and in developing standards for their utilization and his international achievements in spreading the quality control philosophy and in promoting the use of statistical methods in industry."

Robert D. Dugan has accepted a position as Research Associate in the State Farm Insurance Companies. He will be working in the field of personnel research.

David B. Duncan has been appointed Research Associate at the Institute of Statistics, University of North Carolina. He is teaching in the departments of Statistics and Biostatistics and is also spending some time on contract research.

Sidney Epstein is engaged in Human Engineering Research (human factors in equipment design) at the IBM Engineering Research Laboratory in Poughkeepsie.

M. H. Farrant has joined the staff of Coates, Farrer, & England, Consulting Actuaries.

Melvin D. Fimple, formerly with the Statistical Reliability Unit, Bell Aircraft Corporation, Buffalo, New York, is now Project Statistician, Reliability Research Department, Aeronautical Radio, Inc. (ARINC), Washington, D. C.

Donald J. Fisk, who was formerly employed as a mathematician and analytical statistician by the Army Chemical Corps, Fort Detrick, Frederick, Maryland, is now employed as an analytical statistician at the U. S. Naval Proving Ground, Dahlgren, Virginia. Primary assignments are the statistical design of experiments and acceptance sampling plans and the programming of general statistical techniques for

use on the Naval Ordnance Research Calculator.

Stuart Frankel is currently employed by the Corning Glass Works as a quality control engineer in Corning, New York.

Howard E. Freeman is now Research Associate with the Community Health Project, Harvard School of Public Health.

Seymour Friedland is an Assistant Professor of Economics at Boston University teaching undergraduate and graduate courses in financial analysis and policies, and money and banking.

William C. George has been appointed Assistant Chief of the Foreign Trade Division, Bureau of the Census.

William Gomberg, Director of the Management Engineering Department of the International Ladies' Garment Workers' Union and Adjunct Professor of Industrial Engineering at Columbia University, has been appointed Professor of Industrial Engineering at Washington University, St. Louis.

Charles R. Goodman has been hired as a Stress and Mechanical Design Analyst for the Continental Aviation and Engineering Corporation, Detroit, Michigan.

J. Richard Grant, of the Agricultural Marketing Service, has received a Superior Service Award from the Department of Agriculture.

Richard W. Graves, formerly Assistant Professor of Statistics at Tulane University, is now Lecturer in Business-Government and Business Conditions and Statistician for the Bureau of Business Research at Indiana University.

A. F. Holmes has accepted a transfer within the Department of National Defence from his present position as Test Specialist, Training Command Headquarters, R.C.A.F., Trenton, Ontario, to that of Weapon Systems Analysis Specialist, Directorate of Armament Development, National Defence Headquarters, Ottawa, Ontario.

M. V. Johns, Jr., received a doctorate in Mathematical Statistics from Columbia University in June and is now employed as Research Associate at the Applied Mathematics and Statistics Laboratory, Stanford University.

Barclay Jones has been appointed Instructor in the Department of City and Regional Planning of the University of California in Berkeley.

William R. Jones, Major, USAF, is now assigned as Chief, Support Systems Branch, Office for Qualitative Personnel Requirements Information, Headquarters, Air Force Personnel and Training Research Center, Lackland AFB, Texas.

Irving Katz' new position is Chief of the Programs Branch, Planning Research Division, Directorate of Plans and Programs, Headquarters Air Material Command,

Wright-Patterson Air Force Base. The work is concerned with development and application of electronic data processing equipment to problems in logistics.

Mortimer B. Keats has resigned as Head, Quality Analysis Division, U. S. Naval Powder Factory, Indian Head, Maryland, to accept a position as a statistician in the Quality Control Engineering Section, Light Military Electronics Equipment Department, General Electric Company, Utica, New York.

H. A. Ketchum became Financial Vice President of the Federal Pacific Electric Company, Newark, New Jersey on July 1. He retains his position as Director of FASCO Industries, Inc.

Stanley M. Kolsan, formerly Corporation Statistician for the Gabriel Company, Cleveland, Ohio, is now Statistician for the Steel Conservation and Quality Control Division of Republic Steel Corporation, Cleveland.

William Kruskal has returned to the Committee on Statistics, University of Chicago, after a year's visit with the Department of Statistics, University of California, Berkeley.

Huan P. Kuang has been appointed Professor of Mathematics and Statistics at the Agricultural and Technical College, Greensboro, North Carolina.

Thomas E. Kurtz received his Ph.D. from Princeton University in June 1956 and is now Instructor in the Department of Mathematics at Dartmouth College. He will be associated with the college computing program at MIT sponsored by IBM.

Dick A. Leabo, formerly Assistant Director of the Bureau of Business and Economic Research and Assistant Professor of Business Statistics at the State University of Iowa, is now Assistant Director of the Bureau of Business Research and Assistant Professor in the Department of General Business at Michigan State University.

Eugene H. Lehman, Jr., Assistant Professor of Statistics in the Economics Department at the University of Florida, was during the summer a member of the mathematical staff in the Test Data Group of Vitro Laboratories, Eglin AFB, Florida.

Herbert S. Levine has received a fellowship to study in biostatistics at the Graduate School of Public Health, University of Pittsburgh.

Eugene Lukacs has resigned from his position at the Office of the Naval Research and has accepted an appointment as a professor at the Catholic University of America, Washington, D. C.

Henrik M. C. Luykx, Chief of the Biometrics Division, Office of the Surgeon General, Department of the Air Force, Washington, D. C., has received a citation and meritorious civilian award for distinguished service, superior planning and execution

of assigned functions, and able representation of the Surgeon General at both national and international conferences.

John H. Mackay received a Ph.D. in Statistics from North Carolina in June and has accepted a position as Associate Professor with the Georgia Institute of Technology in Atlanta.

Martin L. Marimont has transferred from the Bureau of Labor Statistics to the Commodity and Materials Data Branch, Industry Division, Bureau of the Census.

Eli S. Marks has joined the Operations Research Staff of National Analysts, Inc.

Ross D. Marshall has started work in the Credit Department of the National Bank of Detroit as a credit analyst trainee.

Frank J. Massey, Jr., is now Associate Professor of Biostatistics, School of Public Health, University of California at Los Angeles.

Richard E. Matson recently resigned from the Delco Radio Division of General Motors, Kokomo, Indiana, to accept a position in the Administrative Planning Department, General Sales Office, Ford Division, Ford Motor Company, Livonia, Michigan, as Divisional Organization Analyst.

Francis B. May was employed during the summer in the Employee Relations Department of the Humble Oil and Refining Company teaching a course in statistics as a research tool and consulting on various projects of the department. He is returning to the University of Texas this fall.

Louis L. McQuitty is now Professor of Psychology and Head of the Department of Psychology, Michigan State University, East Lansing, Michigan.

Peter F. Merenda will be on leave of absence from his position as Director, Research Department, U. S. Naval Examining Center, Great Lakes, Illinois, during the 1956-57 academic year. He has accepted a research assistantship at the University of Wisconsin and will complete his Ph.D. in Guidance, with a minor in Statistics.

Irwin Miller, who has recently received his Ph.D. from the Virginia Polytechnic Institute, is now with the Applied Research Laboratory, U. S. Steel Corporation, Monroeville, Pennsylvania.

R. H. Moats, who has been in charge of the Prices Received Section, Agricultural Price Statistics Branch, has been designated Chief of the Livestock and Poultry Statistics Branch, Agricultural Marketing Service.

Donald F. Morrison, formerly a graduate student at the University of North Carolina, has accepted a position as a mathematical statistician with the Lincoln Laboratory, Massachusetts Institute of Technology.

Milton Morrison is now employed by Vitro Laboratories, West Orange, New Jer-

sey, where his duties include work in statistics and operations research.

Judy Moss recently resigned from the Port of New York Authority to accept a position at Revlon, New York City. She will be responsible for the establishment of an integrated data processing system which will coordinate required management statistics and order-billing data flow.

Betty L. Murray, Analytical Statistician in the Biometrics Division, Directorate of Plans and Hospitalization, Office of the Surgeon General, U. S. Air Force, received an outstanding performance award in recognition of her work in biometrics projects.

Richard F. Muth is now employed as Research Associate, Division of Regional Studies, Resources for the Future, Inc. He was formerly Lecturer in Political Economy, the Johns Hopkins University.

Lloyd S. Nelson has taken a position as Specialist—Industrial Statistics with the Advanced Lamp Development Laboratory of the General Electric Company, Cleveland.

Mary L. New is now Research Statistician on the Regional Hospital Study with Community Studies, Inc. This study is sponsored by the National Institutes of Health.

W. L. Nicholson, who spent the past academic year as an Instructor in the Mathematics Department of Princeton University, recently accepted a position as a research statistician with the General Electric Company, Richland, Washington.

Michael F. P. Nightingale received his Ph.D. degree from the University of Wisconsin in June with a major in Statistics. He was employed during July and August by the Metropolitan Life Insurance Company as an actuarial trainee and is now Assistant Professor of Statistics in the Department of Mathematics at Sacramento State College.

Lionel M. Noel, who has been studying post-graduate mathematics (statistics) at Princeton, will become Executive Officer of the U.S.S. Adroit (MSO-509) which is being built at Bath, Maine.

William F. Ogburn is teaching at the University of Delhi during 1956-57.

David B. Orr received his Ph.D. in Research Psychology and Measurement from Columbia University in May and is now working for the Washington, D. C. branch of the American Institute for Research as Research Associate.

Bernard S. Pasternack received an M.S. degree in Experimental Statistics from North Carolina State College in June 1956. After spending the summer as a mathematical statistician in the Statistical Research Division of the Bureau of the Census, he is continuing his studies for a Ph.D. degree as a Graduate Fellow in the Department of Biostatistics in the School of Public Health at the University of North Carolina.

Victor E. Paulos has joined the Ramo-Wooldridge Corporation as a member of the technical staff in the Propulsion and Structures Department, Guided Missile Research Division.

Leon Pritzker has returned from a year's leave of absence at Case Institute of Technology to his position in the Statistical Research Division, Bureau of the Census. He will work on methods of measuring the accuracy of statistics.

Charles K. Ramond was released from active duty with the U. S. Army in Tokyo March 1, and has taken a position as Research Psychologist in the Advertising Department of the E. I. du Pont de Nemours & Co., Wilmington, Delaware.

Charles D. Roberts, Captain, AGC, has been assigned to a new duty station with the U. S. Army in Korea.

Jean Roberts is Assistant Chief, Division of Research and Special Studies, Office of Vocational Rehabilitation, Department of Health, Education and Welfare.

John C. Rowan has returned to Washington to again work with the U. S. Public Health Service (Division of Dental Resources).

Vincent Schultz has completed two years of postdoctoral work in the Department of Biostatistics, Johns Hopkins University, and is now Associate Professor of Agricultural Statistics, Agricultural Experiment

Station, University of Maryland. His present position involves teaching Agricultural Statistics and acting as Chief Statistical Consultant for the Agricultural College and Experiment Station.

John C. Sevier has resigned from his position at Pennsylvania Military College to join the faculty of Temple University as Assistant Professor of Business Administration. He will teach Industrial Management, Office Administration, and Analysis of Industry, including graduate courses.

Jacob S. Siegel has transferred from the Foreign Manpower Research Office, Bureau of the Census, to the Population and Housing Division, as Chief of the Population Estimates and Projections Branch.

Edson I. Small, formerly with Monroe Calculating Machine Company, has been appointed Manager of Market Research at the Underwood Corporation, New York City.

Robert H. Smith has resigned from Stanford Research Institute to become Business Research Associate with the Pennsylvania RR in Philadelphia.

Morris J. Solomon, formerly with the Statistical Research Division, Bureau of the Census, has joined the staff of the Operations Analysis Branch of the American Greetings Corporation at Cleveland.

Julian C. Stanley has completed a 15-month leave of absence during which he studied mathematics at the University of Michigan and statistics at the University of Chicago, and returned to his position as an Associate Professor of Education at the University of Wisconsin.

Zenon Szatrowski, Chairman of the Statistics Department, School of Business Administration, University of Buffalo, is on leave for the period 1955-57. His present position is that of Staff Consultant at the Scientific Computing Center, International Business Machines Corporation, New York City. He is working on the application of electronic computers to statistical problems.

Earl A. Thomas, formerly with the Armour Research Foundation, has accepted

Continued on back cover

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 293) SHOWING THE OWNERSHIP, MANAGEMENT, AND CIRCULATION OF *The American Statistician*, published 5 times yearly at Washington, D. C. for October, 1956.

1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, American Statistical Association, 1757 K Street, N.W., Washington 6, D. C.; Editor, Morris Hansburg, Dietrich Hall, University of Pennsylvania, Philadelphia, Pa.; Managing editor, none; Business manager, Edgar M. Bisgyer.

2. The owner is: (If owned by a corporation, its name and address must be stated

and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member must be given.) American Statistical Association, 1757 K Street, N.W., Washington 6, D. C.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation,

the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

American Statistical Association,
by: Edgar M. Bisgyer,
Office Manager.

Sworn and subscribed before me this
21st day of September, 1956.

Mary P. Windsor
Notary Public
(My commission expires April 14, 1959)

CHAPTER NOTES

Albany

A panel meeting on social security for state and municipal employees was held on April 17th. Mildred Lauder of the New York State Division of Employment was moderator, and the speakers were Charles Dubuar, Chief Actuary, State Insurance Department, and Max Weinstein, Chief Actuary, State Employees' Retirement System.

At the business meeting held the evening of June 19th the following officers were elected for the 1956-57 season:

President—BASIL Y. SCOTT
Vice-President—SYLVIA L. PARKER
Secretary—IRVING D. GOLDBERG
Treasurer—WILLIAM THOMPSON

The third annual Conference on Government Statistics was held on May 24th. The subject of the morning session was "Statistics Applied to Human Problems." The speakers and their topics were: Donald C. Riley, Secretary-Treasurer of the American Statistical Association, "Improvements in the Measurement of Human Resources"; Sam Shapiro, Assistant Director, Division of Research and Statistics, Health Insurance Plan of Greater New York, "Social and Economic Characteristics Influencing the Receipt of Medical Care"; Earl Allgaier, American Automobile Association, "Factors Related to Traffic Death Rates"; and Dr. James L. Goddard, Bureau of State Services, U. S. Public Health Service, "Establishing a Driver Research and Testing Center." At the luncheon meeting Raymond G. McCarthy, Director of Alcoholism Research, Interdepartmental Health Resources Board, spoke on "The Treatment of Alcoholism—Progress and Problems." Two panel meetings were held in the afternoon. The subject of the first of these was "Estimating the State's Revenues"—the evolution of the revenue estimating function, the role of the Budget Division and the operating department, the tools available and how they are employed. The chairman was Clark D. Ahlberg, Deputy Director, Division of the Budget, and the members of the panel were Robert S. Herman, Director of Research, Division of the Budget, and William A. Sharkey, Department of Taxation and Finance. The second panel meeting on "Statistics of Crime and Delinquency" was chaired by Willard F. Johnson, Administrative Officer, Division of Institutions and Agencies, N. Y. State Department of Social Welfare. Robert P. Capes, Executive Secretary, N. Y. State Youth Commission, and Herbert L. Bryan, Director of Research, N. Y. State Department of Correction, composed the panel.

Boston

On June 5th Dr. Gottfried Noether, of Boston University, addressed the chapter on the subject of some quick methods of statistical analysis. The following officers were elected for 1956-57:

President—DR. EUGENE W. PIKE, Lincoln Laboratory
Vice-President—COL. JOHN G. BOOTON, U. S. Army, Retired
Secretary—RUTH S. BRUSH, U. S. Department of Health, Education and Welfare
Treasurer—EUGENE E. BURLINGAME, Arthur D. Little Co.

Buffalo-Niagara

At the meeting in February, Arthur Stein of Cornell Aeronautical Laboratory spoke on "Statistical Techniques in Industry." Mr. Stein described some recent advances in the field of sampling inspection, emphasizing some techniques which have also proved of great value in other areas of application.

The March meeting was devoted to a Symposium on Statistical Inference. Statistics in Cancer Research was discussed by Dr. Abe Lilienfeld of Roswell Park Memorial Institute. Dr. Lilienfeld reviewed the many investigations which have shown a high correlation between lung cancer and cigarette smoking. U. O. Lappi of Cornell Aeronautical Laboratory spoke on "Flight Measurements of Atmospheric Turbulence Viewed as a Stationary Process." Mr. Lappi reviewed studies at Cornell aimed at correlating atmospheric turbulence with basic meteorological parameters. Prof. John Loga of the University of Buffalo Philosophy Department spoke on "The Validity of Statistical Inference." He summarized the various philosophical attitudes toward conclusions based on statistical evidence.

The newly-elected officers of the Buffalo-Niagara Chapter are:

President—DR. ABRAHAM M. LILIENFELD, Chief, Dept. of Statistics and Epidemiology, Roswell Park Memorial Clinic, and Associate Professor of Preventive Medicine and Public Health, University of Buffalo
Vice-President—R. H. MATTHIAS, Mathematician-Statistician, Electrochemicals Dept., E. I. du Pont de Nemours & Co., Inc.
Secretary—DR. MARY MONK, Instructor in Medical Statistics, Dept. of Preventive Medicine and Public Health,

and Lecturer in Psychology, University of Buffalo

Treasurer—V. L. BACCHETTA, Research Statistician, Electrochemicals Dept., E. I. du Pont de Nemours & Co., Inc.

Central Indiana

The chapter's final 1955-56 meeting was held at Indiana University. The speaker was Dr. Herbert R. J. Grosch of General Electric's Gas Turbine Division. His topic was, "The Digital Computer as a Research and Development Tool". The discussion centered around the uses of the newer high-speed computers beyond the traditional job of computing, i.e., simulation (model building and checking); real-time control; input-output performance; and the even newer, logical, non-arithmetical problem solving. Dr. Grosch pointed out that the "shotgun approach" to design checking with high-speed machines is often economical since it saves valuable engineering time while completely utilizing machine time. The new machines, then, in their storage, condensation, retrieval, and analysis of information are "machines" relative to human thinking in the same sense that the gasoline engine is a machine relative to human muscle power.

The officers of the Central Indiana Chapter for 1956-57 are as follows:

President—VIRGIL L. ANDERSON, Statistical Laboratory, Purdue University
1st Vice-President—DONALD L. CHEAK, Indianapolis
2nd Vice-President—CHARLES HICKS, Statistical Laboratory, Purdue University
Secretary-Treasurer—JOHN R. VIRTIS, Department of Economics, Indiana University

Chicago

The chapter's annual forecast dinner meeting was held on June 7th. Chapter members had been asked to send in their forecasts for four key economic indexes for October 1956 and April 1957. These were: total personal income, total civilian employment, industrial production (FRB index), and wholesale prices (BLS index). George W. Cloos, Economist, Federal Reserve Bank of Chicago, reported and commented on these forecasts. In addition, William W. Tongue, Economist, Jewel Tea Co., discussed the business outlook as viewed from retail trade, and William B. Gilmour, Manager of the Commercial Research Division, Inland Steel Co., spoke on the outlook as viewed from heavy industry.

The following officers for 1956-57 were elected at the June meeting:

President—ELIZABETH SLOKIN, Illinois Department of Labor

Vice Presidents

Dinner Meetings—RUDOLPH T. ERICSON, Illinois Bell Telephone Company

Midwest Conference—A. ARTHUR CHAROUS, Sears Roebuck & Company

Luncheon Meetings—LAWRENCE R. STICKLER, R. R. Donnelley & Sons Company

Membership—HARLEY C. GATES, Commonwealth Edison Company

Secretary—MARY T. PETTY, Federal Reserve Bank of Chicago

Treasurer—HARRIET S. SIEGEL

During the summer a questionnaire was sent to chapter members designed to guide the officers in evaluating the chapter's activities and aid them in organizing future programs. Members were asked to indicate their preferences as to night of meeting and times for holding the annual Midwest Conference, suggestions for topics and speakers, and interest in participating in a series of classes in statistics. General comments on the chapter's programs during the past year and suggestions as to how the Chapter could be of greater value were also solicited.

Cleveland

Election of Cleveland Chapter officers for next year have been held with the following results:

President—RUSSELL HALEY, American Greetings Corp.

Vice-President—DAVID FRAZIER, Standard Oil of Ohio

Secretary—ARTHUR LITTELL, Western Reserve University

Connecticut

Professor Robert Summers of the Cowles Foundation for Economic Research at Yale University was the speaker at the dinner meeting held on May 23rd. Professor Summers' subject was "Some Statistical Applications of High Speed Computing Machines."

Dayton

The Chapter elected the following officers for the year beginning July 1, 1956:

President—DR. MAX ASTRACHAN

Vice-President—RICHARD BIEDENBENDER

Secretary—MRS. JEANNE TRUETT

Hawaii

A luncheon meeting was held on April 27th at which Will B. Johnstone, Assistant Treasurer of the Hawaiian Electric Com-

pany, Ltd., discussed the successful procedures he has developed for forecasting electric current demands in Honolulu for two and five year periods. The talk was illustrated with charts, and comparisons were made with mainland utility procedures.

A panel discussion on "Statistical vs. Clinical Basis of Inference" was held at the dinner meeting of May 18th. Members of the panel were Dr. Fred E. La Fon, Assistant Professor of Psychology, Dr. David B. Carpenter, Visiting Professor of Sociology, and Dr. Robert Schmitt. The need for statistics and the quantitative and case study approaches in reaching conclusions were discussed.

University of Illinois

Officers for the 1956-57 year were elected at the May meeting of the University of Illinois Chapter. They are as follows:

President—DR. WALTER C. JACOB, Department of Agronomy, University of Illinois.

President-Elect—DR. DONALD L. BURKHOLDER, Department of Mathematics, University of Illinois

Secretary—FREDERICK WILLIAMS, Department of Economics, University of Illinois

Milwaukee

At the April meeting James R. Helbert, Chemist-Statistician with the Red Star Yeast and Product Co., and Vice-President of the Milwaukee Chapter, spoke on "Some Interesting Cases of Experimental Design."

On July 17th a social meeting was held in the Steinwirt Room. The Pabst Brewing Company was host to the Chapter.

The annual report of the Secretary-Treasurer states that the Milwaukee Chapter now has 73 members. Four business and one social meeting were held during the year, with attendance varying from 28-43. A Chapter Library has been started.

Montreal

The Annual Meeting of the Montreal Chapter was held on May 9, 1956. At that time, the following officers were elected for the year commencing July 1, 1956:

President—CHARLES S. CARTER, Chief Statistician, Bell Telephone Company of Canada

Vice-President—PROF. ROGER LESSARD, Ecole Polytechnique

Secretary—KENNETH E. VROOM, Pulp & Paper Research Institute of Canada

Treasurer—PROF. JACQUES ST. PIERRE, University of Montreal

North Carolina

The Chapter held a meeting at Raleigh on May 4th to hear a lecture by Dr. M. G. Kendall of the London School of Economics. Dr. Kendall's subject was "Can Economics Become an Exact Science?" In this talk he pointed to the necessity for framing economic ideas and models in mathematical or other scientific terms. He pointed out the utility of simulating economic situations with electrical circuits and even solving certain problems by this technique.

The officers elected for the Chapter's 1956-57 year are as follows:

President—GERTRUDE M. COX, Institute of Statistics, N. C. State College

Vice-President—RICHARD L. ANDERSON, Dept. of Experimental Statistics, N. C. State College

Secretary—J. A. RIGNEY, Dept. of Experimental Statistics, N. C. State College

Pittsburgh

At the first regular meeting of the new chapter held on May 9th, Cuthbert Daniel spoke on the role of an industrial consultant. He stated that the requisites for a successful consultant are language facility, mathematical maturity, and an engineering background. Mr. Daniel felt that a statistician could make a significant contribution to the experimenter by making him aware of interactions and components of variation.

Rochester

A joint meeting with the Technical Sub-Group of the Rochester Society for Quality Control was held on April 3, 1956. Miss Besse B. Day of the Bureau of Ships, U. S. Navy, and F. R. Del Priore, U. S. Navy Engineering Experimental Station presented a skit entitled "The Engineer and Statistician Can Meet." This skit was divided into three acts covering the initial discussion, the design and the analysis of a split-plot Latin Square experiment dealing with submarine noise. The emphasis of the skit was on the necessity of cooperation between the engineer and the statistician to obtain a properly designed and analyzed experiment.

The final program for the 1955-56 season was a panel discussion on some applications of statistics in Rochester. Moderator for the panel was the Executive Secretary of the Rochester Chapter, Russell C. McCarthy, Manager of the Industrial Management Council of Rochester. The panel members were Dr. Harold C. Passer and Robert H. Morris of the Eastman Kodak Company, Jack Karger of the New York

State Department of Labor, and Dr. David J. Pittman of the University of Rochester. The panelists first presented brief summaries of the statistical applications and activities in their more specialized fields of interest which were General Business Statistics, Statistics in the Physical and Engineering Sciences, Labor Statistics and Social Statistics respectively. Following the more or less formal presentation, the meeting was opened to well over a half hour of questions from the floor and the success of the meeting can be measured by the fact that time ran out before the questions did.

The officers for the 1956-57 season are:

President—S. LEE CRUMP
Vice-President—J. EDWARD JACKSON
Secretary-Treasurer—JACK KARGER

The Chapter noted with regret the passing of its first Vice-President, Harry A. Weitzman, on March 22, 1956.

Sacramento

A luncheon meeting was held on May 16th at which Hal D. Draper, Professor of Chemistry and Chairman of the Division of Science and Mathematics, Sacramento State College, discussed linear programming.

The annual meeting was held on June 20th. The subject was "What's New in the State Research Departments." Reports were made by the following departments:

Department of Agriculture (Bureau of Agricultural Statistics)
Department of Employment (Research and Statistics Division)
Board of Equalization (Research and Statistics Division)
Department of Finance (Budgets Division)
Department of Justice (Bureau of Criminal Statistics)
Department of Public Works (Highway Planning Survey)
Department of Social Welfare (Bureau of Research and Statistics)

The following officers were elected at the annual meeting:

President—WILBUR L. PARKER, California Department of Employment
Vice-President—MAURICE K. STRANTZ, Manager, Tulalake Irrigation District
Secretary—CARL FRISEN, California Department of Finance
Treasurer—ANN WELCH, California Department of Justice

Counselors—RICHARD D. MORGAN, (Past President), California Department of Mental Hygiene

TELLRAN HAINES, California Department of Finance

ARTHUR DOMONOSKE, California Department of Highways

Southern California

The Southern California (formerly Los Angeles) Chapter of ASA held a dinner meeting on May 31st at which J. Judson Taylor, Vice-President and Treasurer of Western Airlines, discussed "Statistical Procedures as Used in Commercial Aviation." At the June 28th dinner meeting Seymour Fiekowsky, Assistant Professor of Economics at Los Angeles State College, spoke on "Some Modern Statistical Techniques Now Being Taught in State Universities and Colleges."

The last meeting of the 1955-56 year was held on July 26th. The subject was "Statistical Applications in Development Planning," and the speaker was Clark Henderson, Assistant Manager, Economics Division, Southern California Laboratory, Stanford Research Institute. Officers were elected for the coming year as follows:

President—JOHN A. SCOTT, Marketing & Development Engineer, General Telephone Company of California

Vice-President—ALVORD L. BOECK, Market Research Manager, Kwikset Locks, Inc.

Treasurer—ELLIOTT BEIDEMAN, Computer Systems Division, Ramo-Wooldridge Corp.

Secretary—CHARLES I. LANDENBERGER, Senior Engineer, Pacific Telephone & Telegraph Co.

Tulsa

New officers have been elected for the current year. They are:

President—ROBERT SPEARS, Oklahoma A. and M. College

Secretary-Treasurer—MILTON F. SEARL, Stanolind Oil and Gas Company

1st Vice-President—RALPH COLE, Stanolind Oil Purchasing Company

2nd Vice-President—LYNDRAI MARCUM, Oklahoma Blue Cross Plan

Virginia

The Annual General Meeting of the Virginia Academy of Science Chapter was held jointly with the Statistics Section of the Virginia Academy of Science on May 11th and 12th in Richmond. The program consisted of 16 papers and a business meeting. The following officers were elected:

President—JOHN E. FREUND, Department of Statistics, Virginia Polytechnic Institute

Vice-President—N. L. ENRICK, Institute of Textile Technology

Secretary-Treasurer—CLYDE Y. KRAMER, Department of Statistics, Virginia Polytechnic Institute

Past President M. C. K. Tweedie received the J. Shelton Horsely Research Award presented by the Virginia Academy of Science for his paper, "Statistical Properties of Inverse Gaussian Distributions." This award is given for the most outstanding scientific research in Virginia for the year 1955-56. Professor Tweedie's paper was competing with papers in the other 11 Sections of the Academy as well as with other statistical papers. There were over 200 papers presented in the various sections.

Washington

The subject of the May 21st meeting was "Trends in the Development of International Statistics." The speaker was William R. Leonard, Director of the Statistical Office of the United Nations and President-Elect of the American Statistical Association. Tulo Montenegro, Secretary General of the Inter-American Statistical Institute, was the discussant, and Stuart A. Rice was chairman.

New officers of the Washington Chapter for the 1956-57 year are:

President—HOMER JONES, Federal Reserve Board

Vice-President—CHARLES B. LAWRENCE, JR., Office of the Secretary, Dept. of Health, Education and Welfare

Secretary-Treasurer—HAROLD WOOL, Office of the Assistant Secretary of Defense (Manpower, Personnel and Reserve)

Executive Committee—JEROME CORNFELD, National Institutes of Health
MARGARET MARTIN, Bureau of the Budget

SEYMOUR WOLFBEIN, Bureau of Labor Statistics

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a position as Senior Reliability Analyst with the Research and Advanced Development Division of the AVCO Manufacturing Corporation, Stratford, Connecticut.

Gerhard Tintner has been granted leave from Iowa State College to accept a position as Visiting Professor of Econometrics at the University of Vienna, Austria, for the 1956-57 academic year.

George H. Tokuyama is now Assistant Director, Bureau of Health Statistics, Territory of Hawaii Health Department, Honolulu.

Alan E. Treloar is on leave from his position as Professor of Biostatistics at the University of Minnesota to serve as Director of Research for the American Hospital Association. His principal present concern is directing a national study of future

needs for hospital facilities which is being supported by the Public Health Service and the Kellogg Foundation.

Henry Tucker's new position is Statistician for the Agricultural Experiment Station of the University of Arizona.

J. Frederick Verigan's new position is Manager of Quality Control, Crown Closure Division, Crown Cork and Seal Corporation, Baltimore.

Irving Weiss, formerly Assistant Chief of the Foreign Trade Division, Bureau of the Census, has been named Assistant Chief of the Census Operations Division.

Eugene H. Welsand has accepted a position on the faculty in the Department of Psychology at Marquette University, Milwaukee.

William H. Wesson, Jr., formerly of the

University of Chattanooga, has been appointed Visiting Associate Professor of Economics at Louisiana State University.

John W. Wilkinson obtained his Ph.D. degree in Statistics from the University of North Carolina in June 1956. He is now Assistant Professor of Mathematics at Queen's University, Kingston, Ontario.

Loring Wood, formerly Director of Statistics for the NATO International Staff in Paris, has transferred to the Statistical Research Division, U. S. Bureau of the Census, where he will be in charge of the Bureau's work in the measurement and control of response errors.

Max A. Woodbury has accepted a position as Professor of Mathematics in the College of Engineering, New York University.

Dr. John Wishart, distinguished British statistician, died while swimming at Acapulco, Mexico, on July 14th. Dr. Wishart had been Reader in Statistics, University of Cambridge, since 1931. He was the author of several publications in statistics, and was a Fellow of ASA, the Institute of Mathematical Statistics, and the Royal Statistical Society.
